

Chemical Engineering

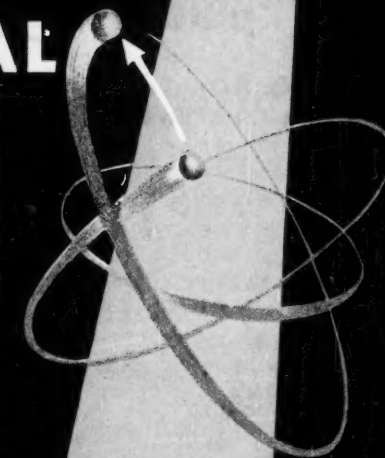
FEBRUARY 1955

NEW PRODUCTS
FASTER REACTIONS with ...

PHOTOCHEMICAL ENGINEERING

YOUR CE REPORT:

- APPLICATIONS
- THEORY
- EQUIPMENT
- PROCESSES
- COSTS
- DESIGN





GIRDLER DESIGNS processes and plants
GIRDLER BUILDS processing plants
GIRDLER MANUFACTURES processing apparatus

GAS PROCESSES DIVISION:

Chemical Processing Plants	Ammonia Plants
Hydrogen Production Plants	Sulphur Plants
Hydrogen Cyanide Plants	Acetylene Plants
Hydrogen Chloride Plants	Synthesis Gas Plants
Plastics Materials Plants	Carbon Dioxide Plants
Ammonium Nitrate Plants	Gas Purification Plants
Catalysts and Activated Carbon	
Fertilizer Plants	

VOTATOR DIVISION: COMPLETE EDIBLE OIL PLANTS

CONTINUOUS PROCESSING APPARATUS FOR...

Textile Size	Lard	Shortening
Shaving Cream	Resins	Lubricating Grease
Paraffin Wax	Soup	Bakery Ingredients
Strained Food	Margarine	Confectioneries
Salad Dressing	Chemicals	Citrus Concentrates
Paper Coating And other Products		

THERMEX DIVISION: HIGH FREQUENCY DIELECTRIC

HEATING EQUIPMENT APPLIED TO...

Foundry Core Baking	Rubber Drying and Curing
Wood Bonding	Plastic Preform Preheating

GIRDLER designs and builds heavy water plant for United States Government

IN 1950 the Atomic Energy Commission submitted to Girdler laboratory data on a process to produce heavy water. Girdler reviewed the existing data, bench-tested, pilot-planted, estimated, engineered, procured equipment for, and constructed an extensive, complicated, chemical processing plant at Dana, Indiana for the AEC. Upon completion of the pilot plant, AEC engaged the du Pont Company as the prime contractor and operator for the project;

with Girdler continuing to carry out phases of work for engineering development, design, procurement, and construction. This vital project for our national defense became a "crash" program with greatly accelerated completion schedules. During the construction of this high-quality plant Girdler established an outstanding safety record.

Girdler's performance on this important Government project again demonstrates Girdler's ability to develop an

idea through the pilot plant, engineering and construction stages into a finished large-scale production plant.

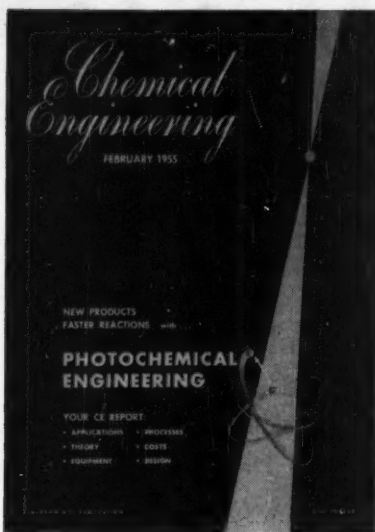
Why not take advantage of Girdler's experience and *proved performance* for *your* process expansion or modernization? We translate basic data into production plants, particularly for high-temperature, high-pressure processes, involving corrosive materials. For information call the nearest Girdler office today.

The **GIRDLER** *Company*

A DIVISION OF NATIONAL CYLINDER GAS COMPANY
LOUISVILLE 1, KENTUCKY

GAS PROCESSES DIVISION: New York, Tulsa, San Francisco
 In Canada: Girdler Corporation of Canada Limited, Toronto

VOTATOR DIVISION: New York, Atlanta, Chicago, San Francisco



Got An Article Idea?

If you have, then we'd like to hear about it. There're two reasons:

- In the first place, your ideas are the best guideposts we have—or can ever get—to the types of articles most of you like or need.

We keep, in fact, a tally of the suggestions you've made from time to time. We use this as a checklist in looking for authors to fill the bill.

Often we're successful in getting just what you've asked for. Then again—as you know—we aren't!

- Secondly, we're interested if you yourself are willing to write for us. Watch our ears pick up!

But one thing we ask: Tell us your ideas in detail before you start. We can then work along with you to save you time as well as to tip you off on how to get the widest readership.

One of the advantages of writing for *Chemical Engineering* is the professional recognition you can get. More chemical engineers subscribe to CE than to any other chemical publication in America.—JRC

• • • Photochemical Engineering: A pioneer roundup of an exciting new field.

This 20-p. report is a bold exploration of basic principles and engineering aspects of photochemical activation. The authors, leaders in their field, contacted over 30 firms and 100 persons for special data. The six sections: Where photochemical engineering can be used, how electromagnetic waves activate molecules, sources of ultra-violet energy, photochemical reactions and processes, process energy needs and costs, design of reactor systems. (p. 159)



Can you, could you, should you . . .

. . . specialize or generalize? For money? For prestige? For satisfaction? Here's a pointed analysis of a problem that's personal as well as vital to every chemical engineer under 40. (p. 179)

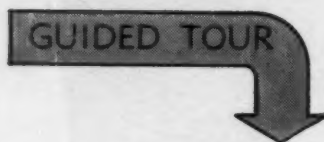


New fractional distillation tools.

Have trouble when you want to know fast-like how tough it'd be to separate two components by fractional distillation under



Please turn page



a variety of conditions? Here're two new nomographs that'll help out. (p. 182)



More new kinks and shortcuts!

Novel water bath gives close temperature control in pipeline reactors; an ingenious way to draw flowsheets to make them easier to use; a drum melter that's sealed against vapor losses; fast way to estimate minimum cost of cylindrical tanks. (p. 202)



New equipment you should know.

For instance, a centrifugal pump that gives low-cost, trouble-free handling of slurries by keeping the impeller out of the path of flow, a new water cone scrubber that gives intimate gas-liquid contact. Lots more in this month's Equipment News, too. (p. 236)



Fresh look in raw materials.

Take a fresh look at our Chemicals & Raw Materials section. It's what you've wanted and better than ever. (p. 140)



Rejoin GUIDED TOUR page 262

Chemical Engineering

FEBRUARY
1955

CHEMENTATOR 103

WHAT'S HAPPENING IN CHEMICAL ENGINEERING

Stanolind Speeding Gas Synthesis Revamp.... 113
No Radiation Injuries 114
Slash Time for Estimating Dryer Costs 120
Polyethylene: Newest Plant Changes Form.... 124
Beat the Softwood Shortage..... 126
SO₂ Absorber: Two Scrubs Better Than One... 132

CHEMICALS & RAW MATERIALS

Resurgent Corrosion Fighter 140
Index to this month's new chemicals..... 142

FEATURE REPORT

Photochemical Engineering 159
Clinton M. Doede and Charles A. Walker

FEATURE ARTICLES

Specialize? 179
Hugh T. Sharp
Distillation Nomographs 182
F. Rodriguez
Help Pick the Next Award Winner..... 184
Gas Turbines For Process Use—II..... 187
Benjamin Miller
Getting at Your Handling Costs..... 193
George A. Smith

CE REFRESHER

Catalytic Vapor Phase Reactions—II..... 195
Thomas E. Corrigan

PLANT NOTEBOOK

- How to Make Flowsheet Easier Reading..... 202**
I. Rodriguez L. and T. Garcia B.

YOU AND YOUR JOB

- You've a Spot in Non-Chemical Industries.... 210**
S. Ricklin

CORROSION FORUM

- Acid-Truck Painting Cost Cut 85%..... 218**

TOMORROW'S TECHNOLOGY

- Resin Production—Batch or Continuous..... 226**
Phthalic Anhydride: From Vapor to Solid.... 228
Another Job for Thermal Diffusion..... 230
Your Checklist of New Patents..... 232

EQUIPMENT NEWS

- Impeller Is Out of Liquid Flow Path..... 236**
Index to this month's new equipment..... 238
Water Cone Cleans Air or Gas Effluent..... 240

CHEMICAL ECONOMICS

- From Fibers to Foams, Chemicals Make Cars... 254**
Consumption Index..... 256
Odor Chasers: Potent Tots..... 258

PICTURED FLOWSHEET

- Ketone Made by Catalytic Dehydrogenation... 272**

OTHER DEPARTMENTS

- Advertiser's Index..... 436**
Book Reviews..... 288
Convention Calendar..... 128
Firms in the News..... 298
Man of the Month..... 279
Names in the News..... 280
New Technical Literature..... 412
Reader Service..... 401
Recent Pamphlets..... 296

CHEMICAL ENGINEERING

February 1955

Vol. 62—No. 2

Publisher..... Wallace F. Traendly
Editorial Director..... Sidney D. Kirkpatrick

Editor..... John R. Callahan
Managing Editor..... Lester B. Pope
Senior Associate Editor..... Theodore R. Olive
Senior Associate Editor..... Cecil H. Chilton
Associate Editor..... Calvin S. Cronan
Associate Editor..... Morgan M. Hoover
Assistant Editor..... Donald R. Cannon
Assistant Editor..... Raymond F. Fremed
Assistant Editor..... Robert B. Norden
Assistant Editor..... Hugh T. Sharp
Assistant Editor..... Edward T. Thompson
Editorial Assistant..... Roslyn K. Gitlin
Art Editor..... Margaret Redfield
Midwest Editor..... Frank C. Byrnes
Southwest Editor..... James A. Lee
Western Editor..... Elliot Schrier
Washington Editor..... E. W. Olcott
Economics Editor..... William H. Chartener
Reader Service Editor..... Alvin J. Babkow

Advertising Director..... B. E. Sawyer
Advertising Sales Manager..... R. S. Muller
Business Manager..... A. J. Mangold
Sales Promotion Manager..... E. A. Atwood, Jr.
Market Service Manager..... Adolph I. Losick
Sales Representatives..... (See p. 436)

Chemical Engineering (with Chemical & Metallurgical Engineering) is published monthly with an additional issue in Mid-September by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. Publication Office: 99-129 North Broadway, Albany 1, N. Y.

► **Executive, Editorial and Advertising:** 330 West 42nd St., New York 36, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

► **Subscriptions:** Write to Chemical Engineering—Subscription Service, 99-129 North Broadway, Albany 1, N. Y., or 330 West 42nd St., New York 36, N. Y. Allow one month for change of address. Please show position and company connection on all subscription orders.

Single copies \$1 in U.S., Possessions and Canada; \$2 in all other countries. U. S. and possessions, \$3 per year, \$4 for two years, \$5 for three years; Canada, \$4 per year, \$6 for two years, \$8 for three years; other Western Hemisphere and the Philippines, \$15 per year, \$25 for two years, \$30 for three years; all other countries, \$20 per year, \$30 for two years, \$40 for three years.

Entered as second-class matter Sept. 3, 1936 at Post Office at Albany, N. Y., under act of March 3, 1879. Printed in U.S.A. Copyright 1955 by McGraw-Hill Publishing Co., Inc. All Rights Reserved. Member A.B.P. Member A.B.C.

More engineers subscribe to Chemical Engineering than to any other chemical process publication. Total net paid circulation of this February issue:

39,099

what is your
PULVERIZING
problem?

we'll test grind a sample for you

with the
SCHUTZ-O'NEILL

Superfine
PULVERIZER

What is your milling problem—uniformity? fineness? Do you need increased output at a lower cost? Without obligation to you, we'll grind a sample of your material in our pilot plant, using a production model Schutz-O'Neill "Superfine" Pulverizer. We'll return your processed product with our Engineering Test Report giving exact data and including recommended Schutz-O'Neill equipment, methods and mill plans for your job.

This will give you full information on the versatility, particle size range and capacity of Schutz-O'Neill "Superfine" Pulverizers. Backed by more than 60 years of continuous manufacturing and field experience.

SCHUTZ-O'NEILL PILOT PLANT uses a standard production model 16" Superfine Pulverizer. Mill components on wall at left in photo provide up to 100 different pulverizing set-ups, with a range from 40 mesh to 5 microns.

Below are
two typical pul-
verizing problems
that were solved
by SCHUTZ-O'NEILL

NO. 1 PULVERIZING CERAMIC MOLDING MATERIALS

THE PROBLEM: To develop ceramic materials for precision molding of high temperature, high fidelity alloy castings for jet aircraft engines. Castings of molybdenum, columbium, and other rare metals were to be made. By producing precise castings, less machining is required and more rare metal saved. The particle size for best results (determined by university consultants) fell within the 60 to 200 mesh range.

THE TESTS: The Schutz-O'Neill pilot plant processed 200 pounds of the feed material, in a series of tests with the university ceramic consultants and the contracting firm present.

THE SOLUTION: Schutz-O'Neill designed a system that is now producing 1,000 to 1,200 pounds per hour of ceramic material 85 to 90 percent within the required 60 to 200 mesh range.

NO. 2 PIGMENTS UNDER 25 MICRONS FOR COLORING PLASTICS

THE PROBLEM: A leading chemical firm producing a variety of resins and plastics wanted to reduce and intimately blend pigments for coloring molded plastic forms. The manufacturer found that particles larger than 25 microns produced streaks in the finished molding. In addition, tints prepared from more than one color necessitated absolute dispersion and optimum blending to insure proper shading and depth.

THE TESTS: Pilot plant test runs were conducted at Schutz-O'Neill. The resulting product was analyzed in the manufacturer's lab. In their report to Schutz-O'Neill, the firm stated, "In all our tests your grinder was equal to or better than the others from the standpoint of fineness of grind and absence of pigment specks in our product".

THE SOLUTION: The chemical firm is being supplied with a 22" Schutz-O'Neill stainless steel Pulverizer.

Write Us:

Tell us the stock you want to pulverize, fineness, capacity desired; we'll send shipping instructions. Or, write for literature desired on Schutz-O'Neill Pulverizers, Granulators, Roller Mills, Sifters, Cyclone Collectors, Hammer Mills.



SCHUTZ-O'NEILL COMPANY

PULVERIZERS • GRANULATORS • ROLLER MILLS • CYCLONES • SIFTERS • HAMMER MILLS

301 PORTLAND AVENUE • MINNEAPOLIS 15, MINNESOTA





Swenson Long-Tube Vertical Evaporators Booklet on high-capacity, steam-saving evaporators for concentrating mobile and foamy liquids and heat-sensitive materials.

Bulletin E-100



Swenson Forced Circulation Evaporators 8-page bulletin tells about Swenson "F.C." evaporators for continuous economical concentration of viscous, salting, and scaling liquors.

Bulletin E-107



Swenson Spray Drying Equipment 16 pages of facts, photographs, and diagrams explaining principles and advantages of spray drying and the Swenson plant-scale research laboratory.

Bulletin D-105



Swenson Research Spray Dryer A folder that describes and illustrates Swenson's completely packaged spray dryer for laboratory and pilot plant operations.

Bulletin D-106



Swenson Rotary-Drum Vacuum Filters Describing and illustrating Swenson job-engineered filter equipment for continuous low-cost, efficient filtration and washing.

Bulletin F-100



Swenson Top-Feed Filter An illustrated folder presenting Swenson's efficient, money-saving top-feed filter equipment that dewater and dries crystalline materials in one process.

Bulletin F-101



Swenson Vacuum Crystallizers An 8-page booklet . . . describes Swenson crystallizers—individually engineered for minimum cost, maximum recovery of crystals, top quality of product.

Bulletin C-100



Swenson Recovery Equipment for Pulp Mills Illustration, description and discussion of Swenson pulp washers, explaining advantages of advanced engineering features.

Bulletin E-108



Heat Transfer and Crystallization A 52-page book giving practical presentation of the fundamentals of modern evaporation and crystallization methods and equipment.

Bulletin E-106

GET THIS IMPORTANT
INFORMATION ON
evaporation
AND
spray drying!

TEAR OUT THIS
COUPON
AND MAIL IT TO US
TODAY!

SWENSON EVAPORATOR COMPANY
15669 Lathrop Avenue, Harvey, Illinois

SWENSON

Proved Engineering for the Process Industries

SINCE 1889



Firm Name _____

Attention _____

Address _____

City _____

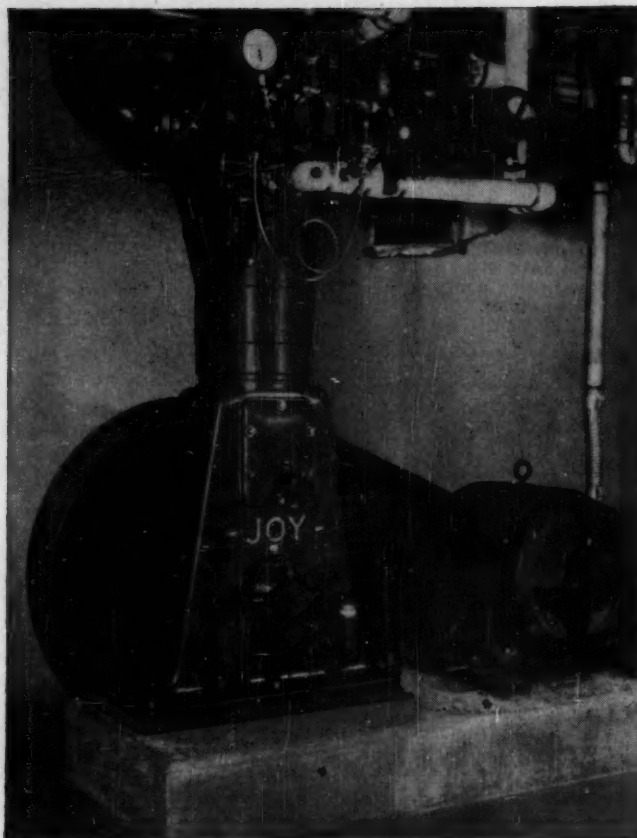
Zone _____

State _____

PLEASE SEND US THE FOLLOWING:

☐ E-100 ☐ E-107 ☐ D-105 ☐ D-106 ☐ F-100 ☐ F-101 ☐ C-100 ☐ E-108 ☐ E-106

Here's How One Company Gets Oil-Free Compressed Air for Antibiotics



TWO JOY WGO-9 OIL-FREE COMPRESSORS DELIVER THE AIR ... DRY, CLEAN and WITHOUT A TRACE OF OIL

THIS WAS THE PROBLEM: A large antibiotic manufacturer required oil-free air for sterile finishing operations in the production of penicillin and other antibiotics.

THIS WAS THE ANSWER: A Joy WGO-9 vertical, oil-free compressor was placed in service in 1951. It provided 300 cfm of air at 100 psi, and was operated continuously. The space-saving vertical design allowed a very compact installation. The service was excellent and the operation very economical—so much so that the company added a sister unit in 1953.

THIS IS HOW IT WAS DONE: Joy oil-free compressors are equipped with carbon graphite piston rings.

These need no lubrication and compensate automatically for wear. Special lightweight pistons; large, direct air passages; and liberal water-jacketing reduce heat and minimize ring wear. Patented Dual-Cushion valves are made of corrosion-resistant materials. All wearing areas, except rings, are either chrome-plated, surface-hardened, or made of stainless steel.

FREE BULLETIN A-44 TELLS STORY: Joy builds regular and oil-free compressors to meet any capacity and pressure requirement. For your copy of Bulletin A-44, write *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.* In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



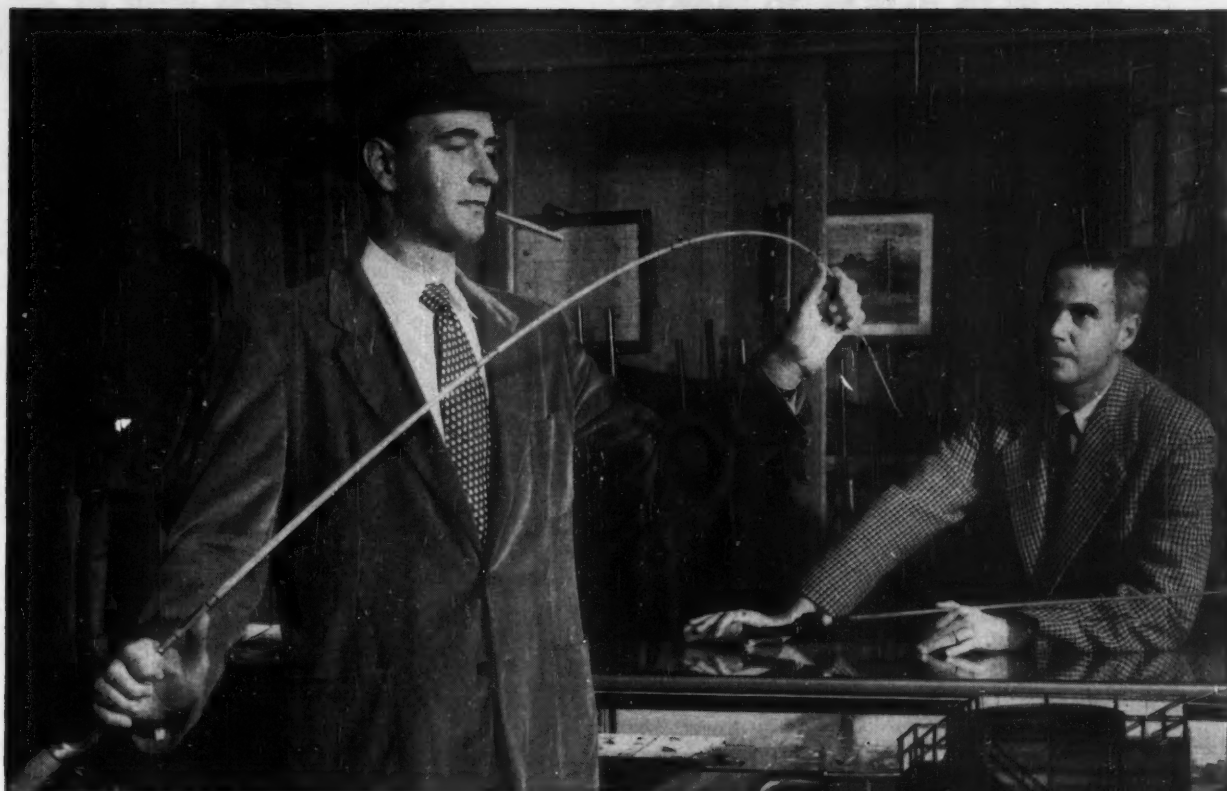
Consult a Joy Engineer

FOR VANEAXIAL FANS • COMPRESSORS •
VACUUM PUMPS AND BOOSTERS •
OXYGEN GENERATORS

W & D 1-5470

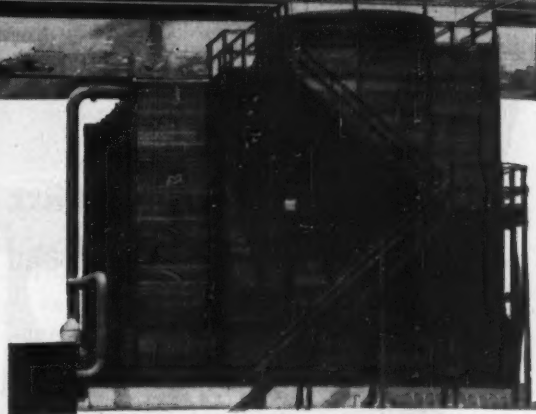
JOY

SPECIALISTS IN THE COMPRESSION AND
MOVEMENT OF AIR AND GASES SINCE 1885



He tests his purchases...

Do you?



Before he parts with \$24.95, he tests a fishing rod to see how it will perform when the big ones strike. Yet last year, his department spent more than \$100,000 for a cooling tower—and *nobody* has ever found out how it will perform under peak conditions!

Only a test will tell. The simplest and most positive test procedure is outlined in a new Marley technical publication, "Test Your Tower". By applying this conclusive test, you *know* the difference between actual and speci-

fied performance . . . you *know* how close your tower approaches the "guaranteed" performance you paid for.

With "Test Your Tower", a minimum of effort, and very little apparatus, you can determine performance of any industrial cooling tower under actual operating conditions. Just ask your Marley representative in any of 50 cities for your free copy, or mail the coupon below.

MAIL

COUPON

TODAY



Founder-member of the Cooling Tower Institute

The Marley Company

Kansas City, Missouri



Technical Services Dept.
The Marley Company
218 W. Gregory Blvd.
Kansas City, Mo.

Please send me a copy of your new brochure, "Test Your Tower."

Name.....

Firm.....

Address.....

City..... State.....

There's No Other Welding Tee Like This!



FLOWLINE

TRADE MARK
STAINLESS STEEL, MONEL, NICKEL and ALUMINUM WELDING FITTINGS
Preferred for Dependable Corrosion Service

The Welding Fittings organization — recognizing the superiority of welded piping for corrosion service — was the first to standardize, manufacture, and stock a complete line of stainless steel welding fittings.

The tee shown above—typical of all FLOWLINE Welding Fittings—provides unique features that have been developed through long, intensive specialization in design and production of welding fittings for corrosion service.

FLOWLINE fittings—tees, ells, reducers, stub ends, and caps—are available in sizes $\frac{1}{2}$ " through 12", in Schedules 5S, 10S, 40S, and 80S.

WELDING FITTINGS CORP.
NEW CASTLE, PENNSYLVANIA

W-10

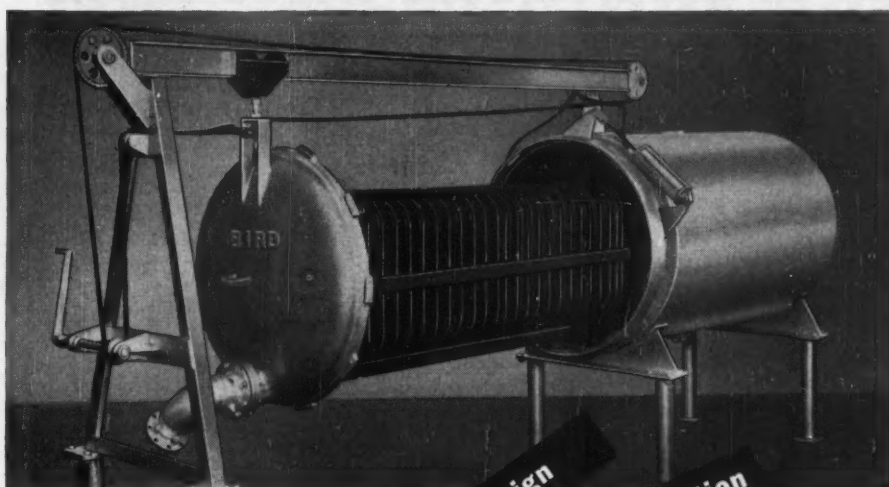
World's Largest Manufacturer of Stainless Welding Fittings

Features of FLOWLINE Tees

- Cold formed — seamless — by the exclusive Welding Fittings process.
- Reinforced crotch—tee is stronger than pipe with which it is used.
- Full center to face dimensions.
- Smooth interior walls.
- Ends machine tool cut and finished.
- Annealed, cleaned bright, passivated.
- Heat number permanently stamped on each tee as record of actual analysis and physical properties.
- Every tee is marked with type of metal, size, schedule, wall thickness, and FLOWLINE trade mark.

BIRD IS THE WORD...

**for the
latest
and
best in**



PRESSURE FILTER

design

construction

performance



Bird Pressure Filter leaves are designed and built to take it. No others could stand a test like this.

Compare this newest of Pressure Filters with any earlier models.

Compare it for DESIGN. Advanced leaf design, for example, provides greater strength — larger sustained filtering area — higher rate of flow — faster cleaning, removal and replacement.

A new removable filtrate manifold permits ready rearrangement of the leaf bank and balanced distribution of slurry to leaves.

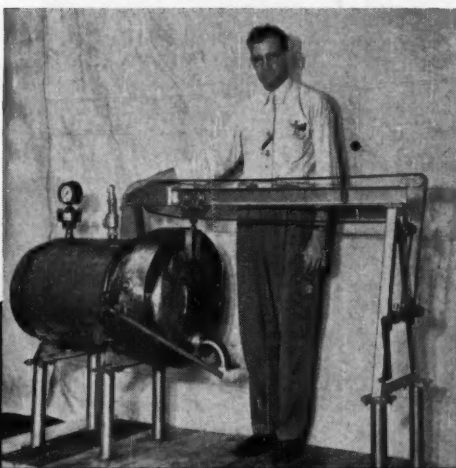
Compare it for CONSTRUCTION. The Bird is built for higher working pressures, hence faster, more thorough filtration. Pressures up to 75 psi are standard — specials up to 250 psi.

The Bird is custom built for the particular application — corrosion resistant alloys or special linings when indicated — insulation or steam jacketing when needed — a great range of sizes to meet almost any volume requirement.

Compare it for PERFORMANCE — Bird can give you the "proof of the pudding" before you commit yourself to an equipment investment. Bird pilot-size Pressure Filters, as pictured, duplicate full scale Filters in every detail. The Bird Research and Development Center provides prompt and reliable test data.

*For the last word on Pressure Filter application,
get in touch with Bird Machine Company.*

Pilot-size Bird Pressure Filter for accurate performance pre-testing.



BIRD MACHINE COMPANY South Walpole • Massachusetts

Builders of Bird Continuous Centrifugal Filters and Classifiers, Bird-Young Continuous Vacuum Filters, Bird-Prayon Continuous Rotary, Horizontal Vacuum Filters, and Bird Suspended Centrifugals

Another new development using

B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Company does not make this vinyl-steel material. We supply only the Geon resin for the vinyl sheeting.

VINYL "SKIN" BONDED TO STEEL GIVES IBM MACHINES PERMANENT BEAUTY

BUSINESS machines must withstand hard steady use, yet retain good appearance for years. It takes a tough, handsome material to fill that bill—and that's where Geon polyvinyl material helps beautifully! The housings of these IBM Proof Machines are fabricated of a vinyl-steel material—vinyl sheeting made from Geon resin laminated to steel.

These machines are often run 24 hours per day, take a beating from shifts of operators. Heavy work loads prohibit their being "down" for any length of time for refinishing. And, because banks must present a business-

like appearance, the machines must always be good-looking. The unique vinyl-steel lamination presents a tough, pebble-grained surface which cleans easily and stays attractive for years.

This exceptional material has a great future in the design of office equipment and furniture, automobile interiors, luggage, wall paneling and vending machines. It may give you an idea for using a Geon material to improve a product and cut maintenance costs. For technical information about Geon materials and how they can be made into products that resist abrasion, heat, cold, oil, gas and many

chemicals, please write Dept. BB-2, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



GEON RESINS • GOOP-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.
GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Keep your cost of lifting down

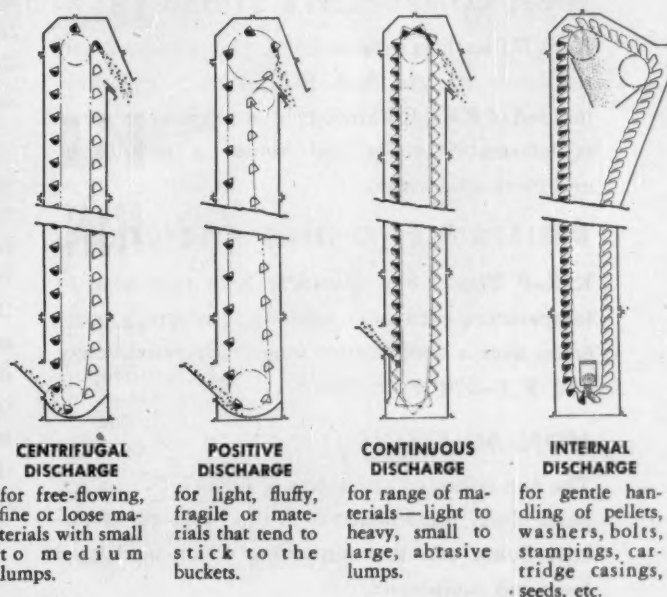
This 78-ft. high Link-Belt steel-encased bucket elevator delivers material to tall storage bins.

Let LINK-BELT recommend the bucket elevator that best meets your requirements from 13 types in 4 basic designs

WHEN a materials handling problem occurs concerning the elevation of loose materials, the first solution is usually a bucket elevator. And, because Link-Belt builds a type and size for a complete range of materials and capacities—you're sure to get the one that's right for your job.

Equally important, when you choose a Link-Belt bucket elevator, you get the lowest possible installation, operating and maintenance costs. Rigid jig-built casings are self-supporting, require only occasional lateral tie-ins depending on height. Periodic inspection is speeded with easy access to both head and boot. Chain or belt tension is maintained at all times with screw or gravity take-ups.

For expert engineering cooperation, call your nearby Link-Belt office. You'll get an unbiased recommendation . . . with no obligation, of course.



LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Sydney; South Africa, Springs. Representatives Throughout the World.

LINK-BELT

BUCKET ELEVATORS

12,340

WHEN FLUIDS ARE

TOO ROUGH

Get the Certain Protection of **KEL-F[®] Plastic**

KEL-F Plastic can supply many of the answers to plant equipment corrosion problems. This fluorocarbon plastic is inert to virtually all chemical attack—including mineral acids, oxidizing agents as well as strong caustics.

HIGH COMPRESSIVE STRENGTH

KEL-F Plastic is outstanding for its resiliency and resistance to cold flow. Ring seals and gaskets molded of KEL-F Plastic exhibit a low percentage of deformation under load—retaining seals longer and more effectively.

RESISTANCE TO HEAT AND COLD

KEL-F Plastic has unusually high resistance to temperature extremes—exhibits satisfactory properties over a temperature range of approximately 710° F. (–320° F. to 390° F.)

NON-ADHESIVE

The non-adhesive properties of KEL-F Plastic are particularly advantageous in the handling of viscous fluids, and in maintaining clean, unclogged lines and equipment.

MOLDABILITY

KEL-F Plastic is readily molded—by injection compression or extrusion. Its dimensional stability and low mold shrinkage make it ideally suited to molding with metal. The techniques of molding this fluorocarbon have been fully developed, and perfected. Today, KEL-F Plastic parts and products are produced in volume by molders throughout the country.

Modern processing methods demand plant equipment with greater resistance to corrosion, temperature extremes and higher pressures. The weak links in such equipment are the valves, gaskets and seals. KEL-F Plastic is providing the solution to many of these problems, and producing demonstrable results in reduced downtime and lowered maintenance costs. It is available as a molding compound, or it can be obtained in rods, tubing, sheets and film from a number of suppliers. It is also available in dispersions, suitable for bake-coating on metals and certain non-metals. The full story of KEL-F Polymer should be in your active file. Write us.

®Registered trademark of
The M. W. Kellogg Company's fluorocarbon polymers.



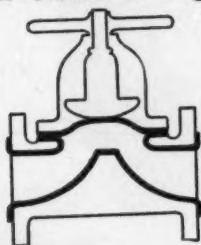
THE M. W. KELLOGG COMPANY

Chemical Manufacturing Division, P. O. Box 469, Jersey City, N. J.

SUBSIDIARY OF PULLMAN INCORPORATED

FOR METAL!

in Valve Linings



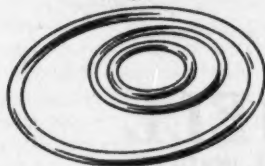
Valve Diaphragms



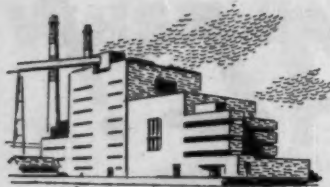
Gaskets



O-Ring Seals



6 new units in 6 years

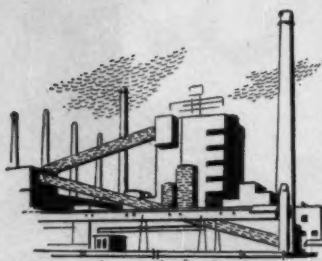


▲ Salem Harbor Station in Salem, Mass.
Two 60,000 kw. units — '51 & '52

for New England Electric System



▲ Manchester St. Station in Providence, R. I.
Two 40,000 kw. units — '48 & '49



▲ South Street Station in Providence, R. I.
55,000 kw. topping unit — '53



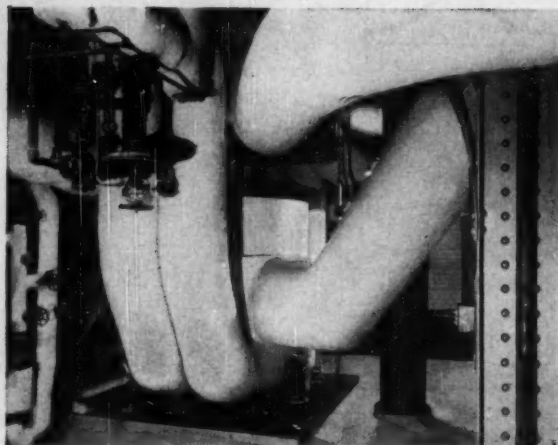
▲ Webster St. Station in Worcester, Mass.
30,000 kw. unit — '50

Proof of the reliability of GRINNELL PREFABRICATED PIPING

Here's a clear-cut case of the value of choosing the right power piping fabricator *from the start!* New England Electric System, when launching its power expansion program, called in Grinnell. Satisfied that Grinnell's facilities rated very high, they okayed Grinnell Prefabricated Piping for the first of a series of new steam-electric generating units. The "proving ground" was to be the unit itself *in service.*

How efficiently that unit performed is written in the record! For starting in 1948, and then each year for 5 consecutive years, Grinnell Prefabricated Piping was employed *exclusively* in constructing 6 new units in the New England Electric System.

This special ability in the fabrication of piping is due to a number of things. Grinnell fabricates in shops under ideal conditions, with modern equipment, by personnel qualified for each class of work. Included in the price (which is determined in advance) are such items of expense as: interpretive engineering, shop sketches and planning, procurement of materials, power services, expendable tools and supplies. There are no charges for waste material or spoilage. All piping is rigidly inspected and tested to comply exactly with customer specifications and applicable codes. Consult Grinnell on *your* next piping installation.



Main steam and reheat lines at reheat intercept valve,
Salem Harbor Station.

ATTENTION! *Company Groups and Technical Associations. A 30-minute color sound film showing the quality and economy of Grinnell Shop Fabrication of all classes of piping is available. Write us, giving date desired.*

GRINNELL
WHENEVER PIPING IS INVOLVED



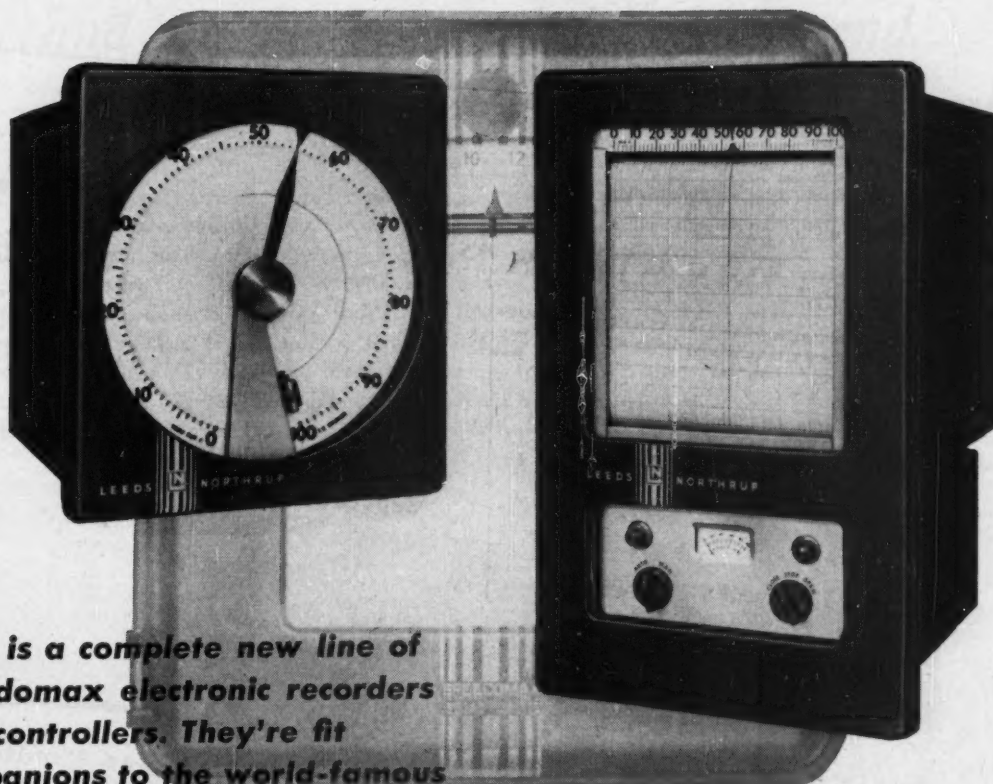
Grinnell Company, Inc., Providence, Rhode Island

Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

New, compact

**Speedomax® Instruments can modernize
process control in hundreds of plants!**



**Here is a complete new line of
Speedomax electronic recorders
and controllers. They're fit
companions to the world-famous
Speedomax Type G. They are called Type H.**

These new instruments can help the operation of a tremendous variety of industrial processes—including many which are perhaps now under-instrumented. And L&N's new production techniques bring Speedomax H equipments within reach of processes which couldn't formerly justify high-quality electronic potentiometers.

Especially significant to operators who now employ filled-system and deflection instruments are the benefits of electronic potentiometer performance. For instance, you can install Speedomax wherever you wish, without a thought for the distance to its sensing element. And Speedomax won't "drift" in accuracy as it ages—it stays on the job and holds the process on spec. If you damage either the sensing element or lead, you simply repair or replace on the job. Speedomax never goes back to the factory for re-calibration, so you do not need spares—thus you save both inventory and storage space.

Anyone familiar with L&N construction will see it again in Type H. The same husky components, anti-friction bearings, rigid assembly and ultra-accessability.

New features include a "fill-in-place" pen; a new, ingenious on-off control switch; more plug-in components. External leads go to a terminal board on outside back of case, for easy installation and maintenance.

One of the round-chart instrument's special features is its long scale; this is used both in setting the control point and for reading temperature. All instruments have especially easy, accurate means for moving the control point setter.

You can choose any type of control action—On-off; Proportional Action; Proportional with rate and reset actions. Any L&N office can supply details and application engineering assistance; or write us at 4916 Stenton Ave., Philadelphia 44, Pa.

LEEDS  NORTHROP
instruments automatic controls • furnaces

Newport Industries, Inc. report: as a unit is very

NEWPORT INDUSTRIES, INC.

ROBIN, PINE OIL, TURPENTINE, TERPENE CHEMICALS
ZINC RESINATES, TALL OIL, PITCH, G.N.S. FLOTATION OILS
GLOSS OILS RAMIE



P. O. DRAWER 911
PENSACOLA, FLA.
TELEPHONE PENSACOLA 8-3144

September 17, 1954

Taylor Instrument Companies
95 Ames Street
Rochester 1, N. Y.

Attention: Mr. W. W. Lockwood
Advertising Manager

Gentlemen:

...The complete instrumentation as a unit is
very highly satisfactory and we would certainly recommend your
instruments to other potential users...

SALES OFFICES

NEW YORK
CHICAGO
CINCINNATI
PHILADELPHIA
HOUSTON
BOSTON

And other
Domestic and Foreign
Industrial Centres

PLANTS

PENSACOLA, FLA.
BAY MINETTE, ALA.
DE QUINCY, LA.
OAKDALE, LA.
CANAL POINT, FLA.
CLEWISTON, FLA.

➡
This Taylor-built graphic panel is in use on a complex process at the Bay Minette, Alabama, plant of Newport Industries, Inc. This compact, flow-sheet type of panel not only lends itself to quicker, easier training of operators, but it also enables the supervisor to visualize instantly how the whole process is running. The Taylor miniature TRANSET* Recorders, Indicators and Controllers tell what is happening at every critical point in the process, and provide every facility for efficient process control.

"The complete instrumentation highly satisfactory..."

...and we would certainly recommend your instruments to other potential users"

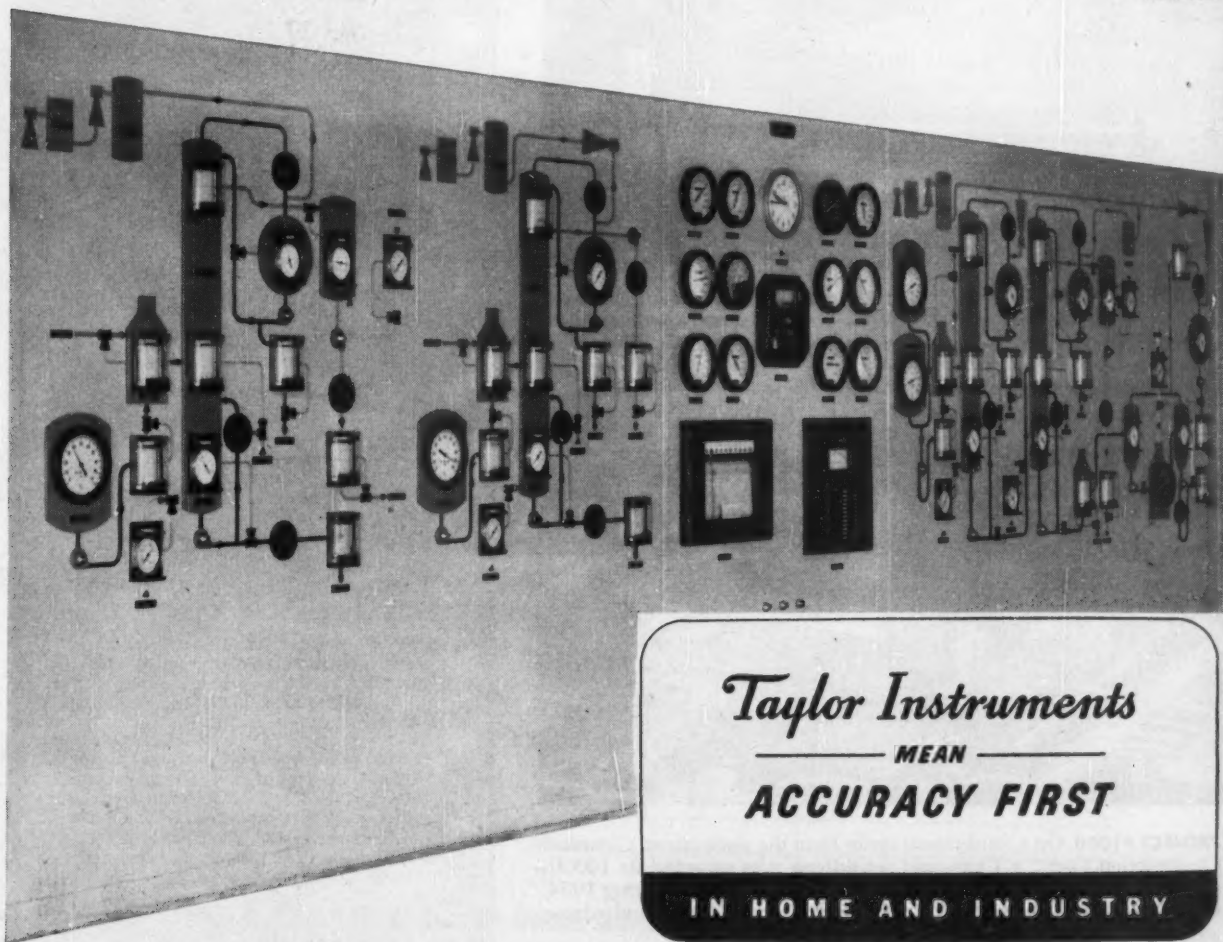
TAYLOR panels are designed and built to meet your specific requirements, from simple open types to accommodate a few conventional instruments, all the way to diagrammatic GRAPHITROL* panels such as the one supplied to Newport Industries, Inc. and pictured below. The experience of Taylor engineers in this specialized field covers many industries, including Textiles, Rubber, Petroleum, Paper, Food, as well as Chemicals. These men are experts—not only

in fabrication, but in their ability to counsel with you in the solving of your particular problem.

Once you call us in, we accept full responsibility for doing the complete job, from helping you select the right kind of panel, through its layout, instrumentation and piping, to actually putting it in operation.

Why not call your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

*Trade-Mark



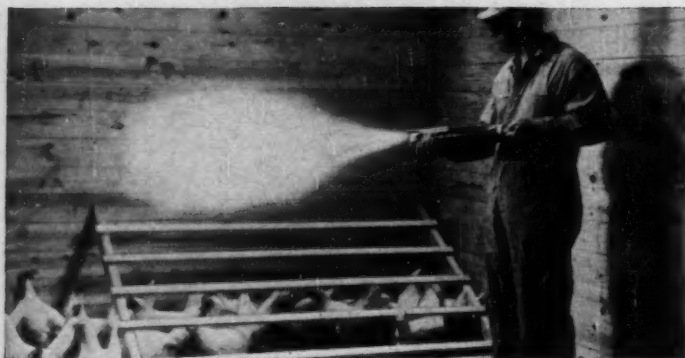
Taylor Instruments
— MEAN —
ACCURACY FIRST

IN HOME AND INDUSTRY

Life...

on the Chemical

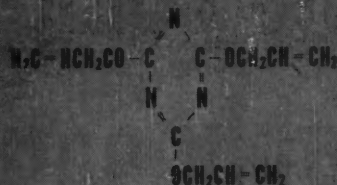
Newsfront



POULTRY NOW CAN BE MASS-VACCINATED against Newcastle Disease by spraying new BIOLATOR® Newcastle Vaccine Dust *Lederle* into the house. One man now can vaccinate 10,000 birds an hour. Birds gain immunity by inhaling the new dust vaccine—a preparation of the live virus type. (No. 1)



PROJECT #1000. On a third repeat order from the same client, Chemical Construction Corp., a Cyanamid subsidiary, was awarded its 1000th job in its 40th year. Among the many projects completed during 1954, Chemico placed "on stream" 1000 tons daily capacity for anhydrous ammonia. (No. 2)



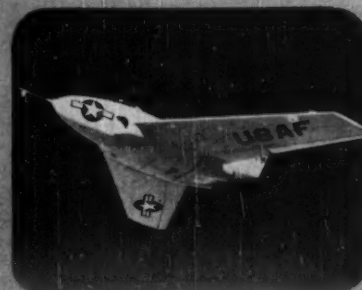
Triallyl cyanurate lends unique heat resistance to plastics for:



Heat-stable, pit-resistant casting resins for safety glasses or windows; and for...

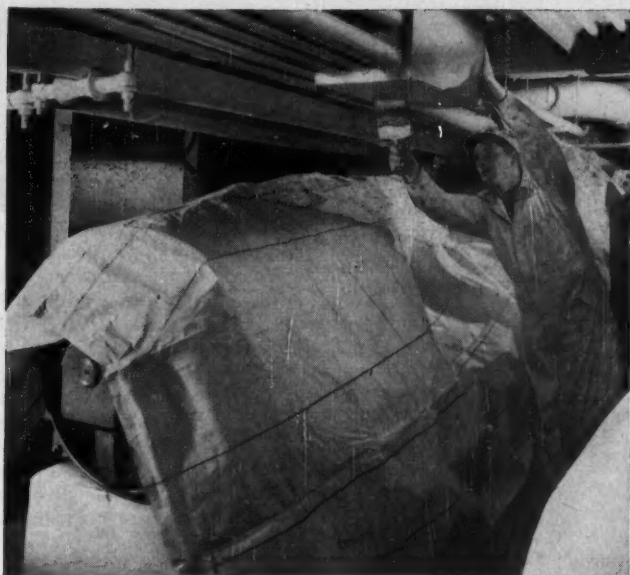


Heat-stable wire coating compositions with excellent electrical properties; and...



Special aircraft applications where a copolymer of triallyl cyanurate and a maleic alkyd make glass cloth laminates with flexural strengths of 30,000 psi even after 24 hours exposure to 500°F.

Triallyl cyanurate, with its stable triazine ring and reactive allyloxy group on each carbon, is used in copolymers to produce such heat-resistant plastics. Recent price reduction gives this chemical added attraction for new product development. (No. 3)



PAPER DROP CLOTHS for painters, made by Fibleco Illinois Corporation, are among many new market-expanding paper products made possible by Cyanamid's MELOSTRENGTH® Resin. The MELOSTRENGTH® Paper is made by Mosinee Paper Mills with MELOSTRENGTH Resin, which binds paper fibers strongly together so paper stays strong even when soaking wet. Because the paper is stronger dry, too, drop cloths stand up through hard scuffing, abrasion and other abuse. Such properties open many new uses for paper. (No. 4)



FOUNDATION FOR THE NEW TRIM LOOK is often a foundation garment woven of rubber thread. When the rubber is compounded with Cyanamid's new ANTIOXIDANT 425*, these garments stay white, with minimum discoloration due to aging of the rubber. ANTIOXIDANT 425, now in full commercial production, gives rubber highest resistance to discoloration yet attainable. (No. 5)

"Cogitations"

AEROCAT TRIPLE A*, High Alumina Catalyst has proved its value in fluid cracking for the petroleum industry. It maintains 15-25% higher equilibrium activity than regular 13% alumina catalyst and permits greater freedom of operation, excellent selectivity, and lower stack losses. (No. 6)

Increasing speeds in papermaking processes tend to accentuate two-sidedness in the finished paper. Differences in color, structure and surface characteristics on the two sides are the most usual effects of two-sidedness. The possibility of two-sidedness always exists because paper is made from a dilute pulp poured on a wire screen followed by drainage of water through the wire. The fines in fibers, fillers and additives tend to be washed out of the bottom or wire side of the paper more than from the top or the felt side. A laboratory method has been developed to produce two-sidedness accurately in sample papers. The method has been used to develop color formulations which give minimum two-sidedness on mill-run sheet. Complete details are available in Technical Bulletin No. 827 of Cyanamid's Organic Chemicals Division. (No. 7)

Wood waste can be converted to hardboard at low temperature cure and short cure cycle with new aminoplastic resins PDL-1-1969 and PDL-1-1970, which give high strength and do not discolor. Hardboard is suitable for structural or furniture applications. (No. 8)

Architectural white enamels made with CYCOPOL® 340-18 copolymer resin stay white longer and retain high gloss even under high humidity conditions. This new CYCOPOL resin has infinite solubility in aliphatic hydrocarbons and promotes excellent flow in enamels. (No. 9)

Relieve edema with DIAMOX® acetazoleamide Lederle, the new oral diuretic and acid-base regulator, which inhibits the enzyme carbonic anhydrase, and reduces acidification of the urine. Oral administration of DIAMOX is easier than injection of mercurial diuretics. DIAMOX, a prescription drug, is particularly effective in congestive heart disease. (No. 10)

More information on any of the products mentioned in these pages is available on request. Write to "Chemical Newsfront," American Cyanamid Company, 30 Rockefeller Plaza, New York 20, N. Y., or use the coupon below—simply checking the items on which you wish additional information.

*Trade-mark



AMERICAN Cyanamid COMPANY

30 ROCKEFELLER PLAZA
NEW YORK 20, NEW YORK

SEND more information on the following items mentioned in the February, 1955 issue of LIFE on the Chemical Newsfront:

C. E.

No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Literature ☐ Prices ☐ Sample ☐ of _____

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

SHOWING FOR THE FIRST TIME - - -

A New Addition to the Dempster-Dumpster System of Low Cost Bulk Materials Handling

● Now you can have either of two types of Dempster-Dumpsters in the fastest, most efficient and lowest cost method of bulk materials handling ever devised.

IN THIS MODERN, low cost system, one truck-mounted Dempster-Dumpster picks up, hauls and empties, or sets down intact, one loaded detachable Dempster-Dumpster Container after another, regardless of design or size, handling bulk materials of practically every description.



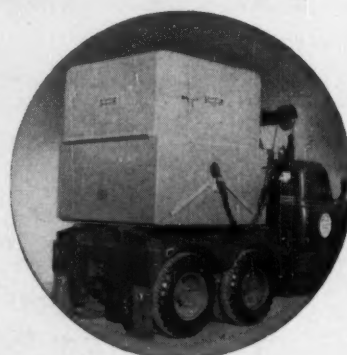
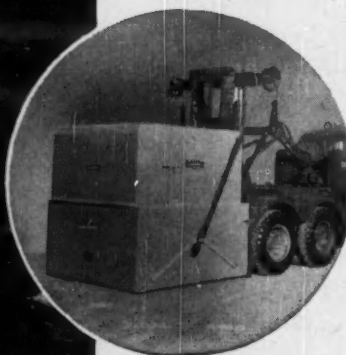
The new Dempster-Dumpster Type DTLF offers several desirable features along with all the economies provided by the Type LFW. These features include: (1) Improved load distribution with container carried in more forward position between wheel centers. (2) Extreme high dumping in cases where it is desired. (3) Vertical pick up of loaded container. (4) Container, loaded or empty, is always in horizontal plane in carrying position. Automatic locking device for positive rigidity of container while in carrying position is, of course, provided.

TREMENDOUS SAVINGS WITH THE DEMPSTER-DUMPSTER SYSTEM HAVE BEEN PROVED BEYOND QUESTION.

One truck-mounted Dempster-Dumpster, operated by only one man, the driver, serves scores of containers of various capacities up to three times greater than the average dump truck. You eliminate trucks standing idle . . . eliminate re-handling of materials . . . eliminate loading crews. You increase efficiency, sanitation and good plant-keeping.

Containers range from 2 to 21 cu. yds. capacity for use with recommended type Dempster-Dumpsters. Each container is designed to suit the materials to be handled—be they trash, rubbish, liquids, dust, bulky, light or heavy. Many leading plants, in almost every type of industry, have found it indispensable after installation. Its proved savings alone justifies an investigation of its potential value in your plant now. Write to us today for complete information. Manufactured and sold exclusively by Dempster Brothers, Inc.

The photo at left illustrates the amazing ability of the Type DTLF Dempster-Dumpster for high dumping. The three photos below show the Pick Up, Haul and Dumping action, hydraulically controlled from cab.



● **DEMPSTER**



Photo above shows the new Dempster-Dumpster Type DTLF dumping 8 cu. yds. of rubbish. At right you see the Type LFW with load in carrying position. Dempster-Dumpsters are available in capacities capable of handling up to 38,000 pound payloads.



One Truck-Mounted
Dempster-Dumpster Handles Scores
of Containers... All Designs... All Sizes

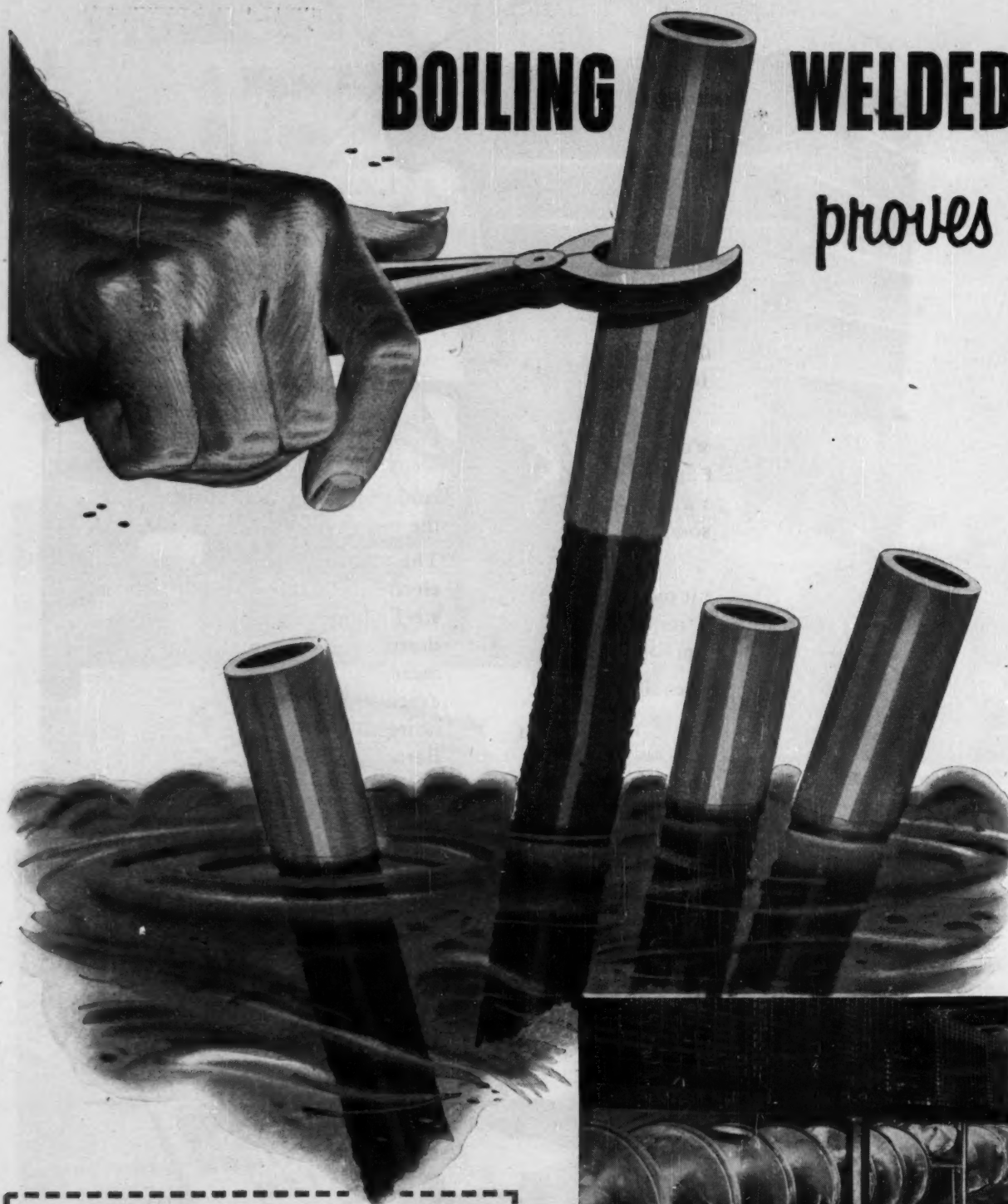
B R O T H E R S, 225 Dempster Bldg., Knoxville 17, Tennessee

CHEMICAL ENGINEERING—February 1955

BOILING

WELDED

proves



REPUBLIC STEEL CORPORATION
3116 East 45th Street,
Cleveland 27, Ohio



Please send me more information on:

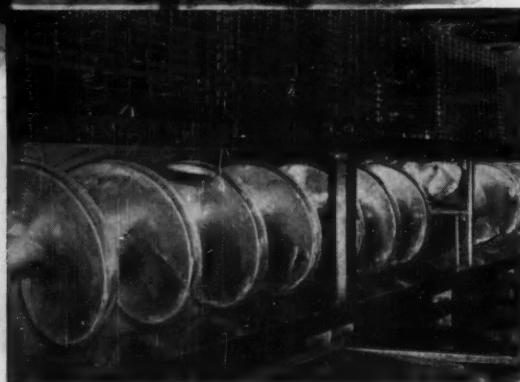
- ☐ Stainless Steel Tubing and Pipe ☐ Stainless Steel-Flat Rolled
☐ Electrunite Dekoron-Coated E.M.T. ☐ Republic Titanium

Name _____ Title _____

Company _____

Address _____

City _____ State _____



REPUBLIC ENDURO STAINLESS STEEL DOES A BIG JOB in this "Thermascrew," a screw conveyor with wide uses in chemical and food-processing. Here Enduro transfers heat or cold through the hollow shaft while the screw is totally immersed in the material being processed. Heat or cold loss is minimized, compared with heating or cooling the outside of a vessel or using a static immersion unit.

STAINLESS STEEL TUBING IN ACID

the Weld is Corrosion Resistant!

Maybe you're one of the few people who hasn't fully accepted that idea up to now. Here's what we do to prove it.

We take a piece of standard Republic ELECTRUNITE Stainless Steel Tubing and put it into a 20 per cent hydrochloric acid solution. Then we let it boil.

When we take it out, the wall thickness has been reduced from .089 inches to .059 inches.

But the weld area is only reduced to .068 inches.

Proof: the weld area is not subject to preferential corrosion.

This is an accelerated lab test. We realize it's only one proof. But we also have on-the-job proof in chemical plants and refineries all over the country, where ELECTRUNITE welded stainless steel tubing is used. And processing corrosion is among the most severe.

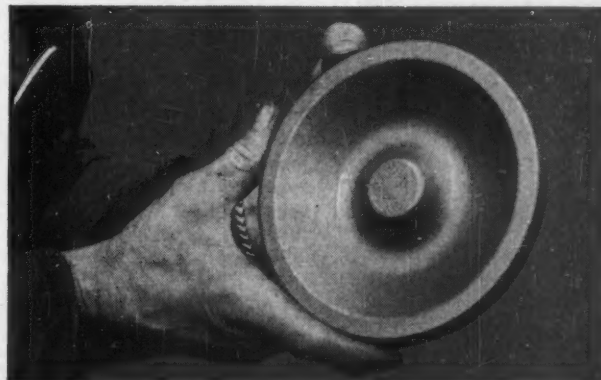
The fact that we've been supplying electric resistance welded stainless steel tubing and pipe to process industries for the past twenty-five years means something for you. Find out exactly how much by calling your nearest Republic district sales office. Better yet, fill out and mail the coupon below.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products



IF YOU HAVE SEVERE CORROSIVE CONDITIONS like these at Kaiser Aluminum & Chemical Corp., Baton Rouge, La., Republic Dekoron-Coated Electrical Metallic Tubing or rigid steel conduit is the answer. This is galvanized steel with a coating of polyethylene, which gives electrical raceways double protection from end to end. Installation is easy. Connections between lengths are protected by vinyl or plastic tape.



YOUR PRODUCT CAN BE AS STRONG AS STEEL, yet weigh only 56 per cent as much. How? If it's made of Republic Titanium or Titanium Alloy. This high strength-to-weight metal, which is also unbelievably corrosion resistant, is now available in all commercial forms. And Republic has been working with it since 1948. We will tell you how and where to use it profitably. (Above: forged compressor rotor.)



for your process use ... ZINC CADMIUM ALUMINUM

ALUMINUM COMPOUNDS

ALUMINUM NITRATE REAGENT
ALUMINUM NITRATE PURIFIED
ALUMINUM NITRATE
TECHNICAL
ALUMINUM SULFATE U.S.P.
GRANULAR

● Baker Aluminum Compounds of controlled purity help simplify processing problems of the electronic, petroleum, leather, textile and other industries. Typical of these compounds is Aluminum Nitrate in its various grades. Specifications follow:

	Aluminum Nitrate Reagent, Crystal	Aluminum Nitrate Purified, Crystal	Aluminum Nitrate Technical, Crystal
Assay ($\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$)	98.0-102.0%	99.0 %	98.0 %
Insoluble Matter	0.005 %	0.01 %	0.01 %
pH of 5% Solution at 25°C	2.5-3.5		
Heavy Metals (as Pb)	0.001 %	0.005%	0.01 %
Sulfate (SO_4)	0.005 %	0.01 %	0.02 %
Iron (Fe)	0.002 %	0.005%	0.005%
Free Acids (as HNO_3)		0.1 %	0.3 %
Chloride (Cl)	0.001 %	0.002%	-
Earths and Alkalies (as SO_4)	0.05 %	0.10 %	
Alkalies (as Na_2O)			0.05 %
Clarity of Solution			Clear

CADMIUM COMPOUNDS

CADMIUM ACETATE
REAGENT CRYSTAL
CADMIUM CHLORIDE
REAGENT CRYSTAL
CADMIUM CHLORIDE
PURIFIED CRYSTAL
CADMIUM NITRATE
REAGENT CRYSTAL
CADMIUM NITRATE
PURIFIED CRYSTAL
CADMIUM SULFATE
REAGENT CRYSTAL
CADMIUM SULFATE
REAGENT ANHYDROUS
POWDER

● Baker Cadmium Compounds meet the exacting requirements of the television, photographic, battery, chemical and other key industries. Representative are Cadmium Nitrate and Cadmium Chloride, available in the grades and specifications listed below:

	Cadmium Nitrate Reagent, Crystal	Cadmium Nitrate Purified, Crystal		Cadmium Chloride Reagent, Crystal	Cadmium Chloride Purified, Crystal
Chloride (Cl)	0.001%	0.005%	Assay ($\text{CdCl}_2 \cdot 2\frac{1}{2}\text{H}_2\text{O}$)	99.0-100.9%	98.0 %
Iron (Fe)	0.001%	0.002%	Insoluble Matter	0.005 %	0.010 %
Sulfate (SO_4)	0.003%	0.005%	pH of 5% Sol. at 25°C	3.5-5.0	3.0-5.0
Copper (Cu)	0.002%	0.005%	Lead (Pb)	0.001 %	0.003 %
Zinc (Zn)	0.05 %	0.05 %	Nitrate (NO_3)	< 0.003 %	
Lead (Pb)	0.005%	0.005%	Sulfate (SO_4)	0.005 %	
Insol. Matter	0.005%		Ammonium (NH_4)	0.001 %	
Arsenic		0.001%	Copper (Cu)	0.0005 %	
Solution (10%)		Clear	Iron (Fe)	0.001 %	
Substances not pptd. by $(\text{NH}_4)_2\text{S}$ (as SO_4)	0.10 %		Substances not pptd. by H_2S (as SO_4)	0.20 %	
			Zinc (Zn)	< 0.05 %	
			Thru U.S. No. 20 Sieve		Max. 15.0%



Baker Industrial Chemicals
"Purity by the ton"

TONNAGE CHEMICALS

... heavy metal compounds of controlled purity

ZINC COMPOUNDS

ZINC ACETATE TECHNICAL
ZINC BROMIDE SOLUTION
OPTICAL GRADE
ZINC CHLORIDE REAGENT
ZINC CHLORIDE N.F.
BROKEN LUMP
ZINC NITRATE REAGENT
ZINC NITRATE TECHNICAL
ZINC OXIDE REAGENT
ZINC SULFATE U.S.P.
GRANULAR
ZINC THIOCYANATE

● Baker provides a dependable and economical source of Zinc Compounds for pigment, adhesive, metal treating, rubber, ink, paint and other manufacturers. Typical are Zinc Nitrate and Zinc Acetate, with these specifications:

	Zinc Nitrate Technical, Crystal	Zinc Acetate Technical, Crystal
Assay ($Zn(NO_3)_2$)	63.0-70.0%	($Zn(C_2H_3O_2)_2 \cdot 2H_2O$) 98.0 %
Insoluble Matter	0.015 %	0.010 %
pH of 5% Solution at 25°C	4.5-6.0	6.0-7.0
Lead (Pb)	0.010 %	0.005 %
Copper (Cu)	0.002 %	

Baker can supply these METALS	In these forms	Chloride	Bromide	Sulfate	Nitrate	Phosphate	Carbonate	Acetate	Chromate	Oxide	Miscellaneous
Chromium											PR
Molybdenum											TPR
Manganese											
Iron (Ferric)											
Iron (Ferrous)											
Cobalt											
Nickel											
Copper											
Zinc											
Cadmium											
Mercury											
Aluminum											
Tin (Stannic)											
Tin (Stannous)											
Lead											
Bismuth											
Bismuth (Sub)											

KEY TO CHART
T—Technical Quality
P—Purified, U.S.P., or N.F. Quality
R—Reagent Quality

Appropriate color designations and symbols indicate these chemicals we can supply in cartons, bags in tonnage lots, and the quality grades available.

Black - Carloads
Grey - Tonnage

HEAVY METAL COMPOUNDS

● Whatever your needs for heavy metal compounds, check Baker. As shown by the chart to the left, Baker can supply a wide variety of these industrial chemicals in tonnage quantities — to precise standards of purity.

The economy of these chemicals will keep your costs low, and Baker's reputation for prompt shipment means "on time" production schedule.

In any quantity Baker "know-how" means industrial chemicals of measured purity. *It pays to buy Baker!*

J. T. BAKER CHEMICAL CO.
Executive Offices and Plant, Phillipsburg, N. J.



FREE Reference File — Baker Process Chemicals

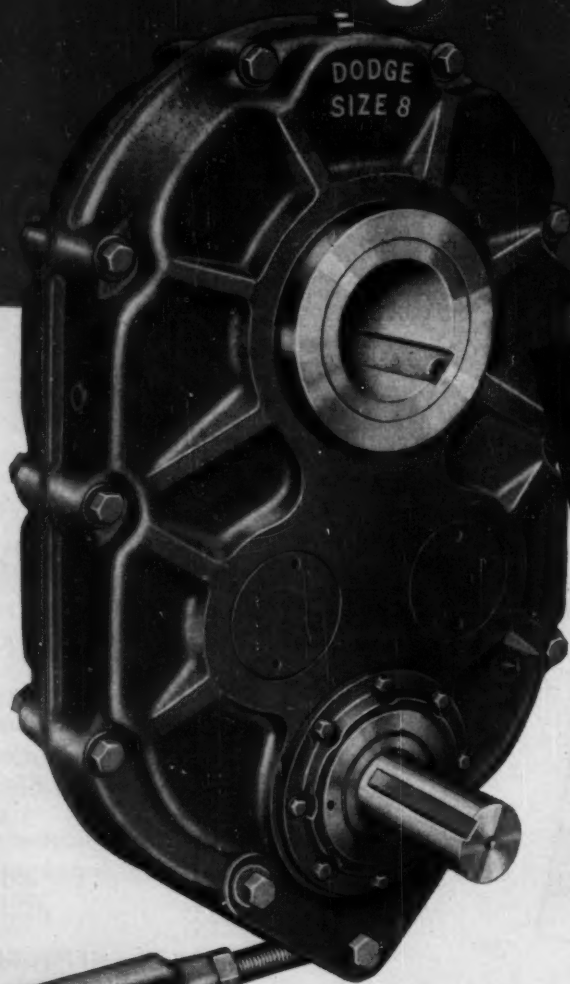
This handy letter-size file folder keeps all your process chemical information handy.

Contains availability charts of Baker Light Metal Compounds, Heavy Metal Compounds, Acid (Inorganic, Organic, Acid Anhydrides) and complete price schedules.

A post card from your secretary brings you this free, useful reference file promptly.



DODGE Torque-Arm



America's most complete

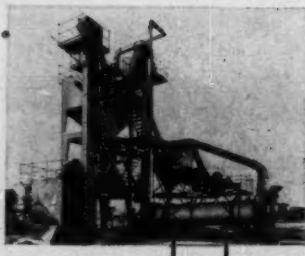
NOW-

**SAVINGS EXTENDED
TO YOUR BIG JOBS
WITH THIS NEW 60 H.P.
SHAFT-MOUNTED
SPEED REDUCER!**

All the advantages of shaft-mounting . . . all the proven performance and economy features of Dodge Torque-Arm Speed Reducers . . . are now available for your *big* jobs. The husky new size No. 8, in the double reduction series, has a capacity of 60 hp at 100 rpm, AGMA rating, and can be mounted on shafts up to 5-inch diameter.

The performance record of Torque-Arm Speed Reducers, as demonstrated in tens of thousands of installations, shows efficiency up to 97%, and substantial savings in costs. These advantages will be even more significant in the big installations for which this newest addition to the line is provided.

Torque-Arm Speed Reducers driving the trunnions rotating an asphalt kiln.





line of Shaft Mounted Speed Reducers!

The new No. 8 has all the inherent advantages of the Dodge Torque-Arm line. No foundation, no flexible couplings, no sliding base required—and there are no lining up difficulties. It is mounted directly on the shaft. The torque-arm, fastened to any fixed object, anchors the reducer. The unit is driven through V-belt drive. Dodge Taper-Lock Sheaves, available from stock, permit any speed ratio desired.

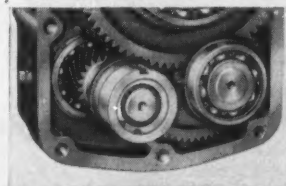
Another new member of the Torque-Arm line is the single reduction No. 11 (1.3 hp at 100 rpm, AGMA rating). Torque-Arm Reducers are now supplied, in both single and double reduction series, with capacities from 1 to 60 hp, output speeds from 12 to 365 rpm. All sizes are available with built-in backstop as well as the Tri-Matic Overload Release which is designed especially for the Torque-Arm Speed Reducer.

For detailed information and recommendations for applications to your needs, call the Transmisioneer, your local Dodge Distributor. Or write for Bulletin.

DODGE MANUFACTURING CORPORATION, 200 Union Street, Mishawaka, Indiana



Tri-Matic Overload Release, optional, loosens the belts, cuts off power, gives a warning in case of an excessive load.



Built-in backstop is available when conditions require a device to prevent the reversal of direction of rotation.



CALL THE TRANSMISIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

DODGE

of Mishawaka, Ind.

PROVEN by 8 years

THOUSANDS of Successful Installations of *Farris* "4 in 1" Safety Relief Valves*

NOTICE:

Farris Safety Relief Valves, the Internal Heat Exchanger, and Bellows construction are covered by U.S. Patents and Patents Pending. Copyrights, where applicable, are registered.

STANDARD FULL NOZZLE SAFETY RELIEF VALVES

Here is the ultimate in nozzle valve construction with complete standardization and interchangeability in every part:

Round wire springs calibrated for rating.

2½ to 1 guiding ratio, close tolerances.

Alignment spool for perfect alignment and bearing from stem to disc.

Self-aligning, optically-flat replaceable disc of forged Stainless Steel.

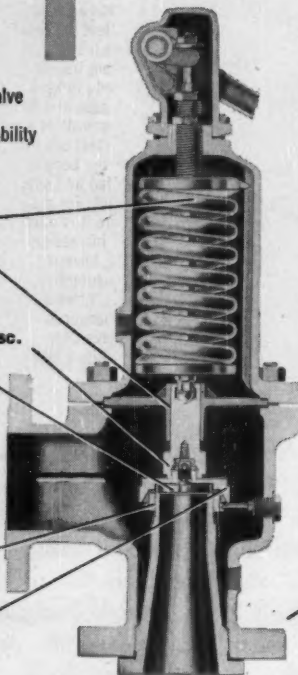
All bearings of hardened Stainless Steel.

Expanded orifices increase capacity.

Single blowdown ring does not affect capacity—simple adjustment.

Flared disc-holder for ultimate operating efficiency.

1



BALANSEAL® SAFETY RELIEF VALVES

BalanSeal construction isolates all working parts. It consists of a neutral area bellows equalling the area of the seating surface, incorporating a mechanically-held seal for the lower part to greatly enhance replacement. BalanSeal can be simply installed any time. Because BalanSeal neutralizes effects of back pressures, resulting in a constant, safe relieving point on the upstream side, size of back pressure piping can be drastically reduced—for pipe savings up to 15 times the cost of the valve! Where accurate set points must be depended upon, BalanSeal stands alone.

For eight years Farris has been setting-the-pace-in-safety with "4-in-1" Safety Relief Valves, the "standard" for long service life, minimum maintenance and positive protection.

Farris' recognition as the pace-setter of the industry is no accident, but the result of many engineering "firsts" in improved valve design—FIRST with balanced bellows construction . . . FIRST to offer multiple nozzle sizes within one valve . . . FIRST with a line of bar stock safety-relief valves for pressures to 10,000 lbs. . . FIRST to offer internal heat exchangers . . . FIRST to offer realistic pricing, giving the customer the benefit of manufacturing economies . . . and only Farris can point to proved-in-service performance . . . because Farris is the pioneer manufacturer of safety relief valves with bellows.

FOR ENGINEERS: Catalog 48Ra on the full line of Farris Safety Relief Valves; and Technical Manual 51B—"Principles of Manifold Discharge Piping". Available on request.

**"THE FOX
AND THE
HARE"**



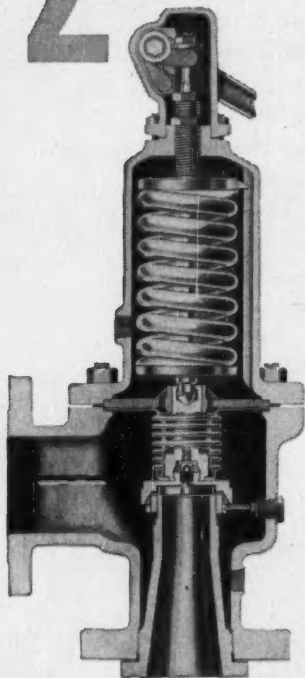
Send for this popular entertaining pamphlet presenting a story about the recognition of BALANSEAL valves. It is humorous and enlightening. Just ask for it by name.

OF ACTUAL SERVICE

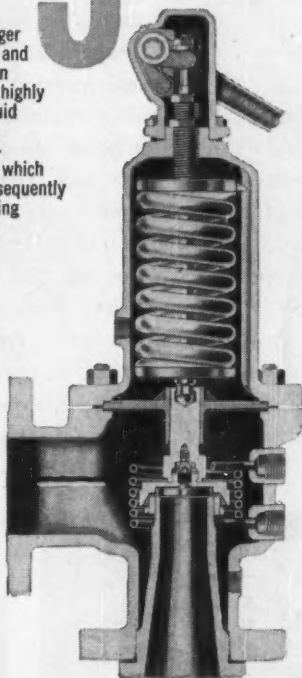
2

INTERNAL HEAT EXCHANGER

The exclusive Farris Internal Heat Exchanger eliminates inefficient and costly steam tracing in a valve body to keep highly viscous media in a fluid state. It consists of a stainless steel coil inserted in the body to which steam is fed and subsequently trapped out. For placing heat where it is most effective, increasing efficiency, lowering steam consumption, the Farris Internal Heat Exchanger is the only available product of its kind.

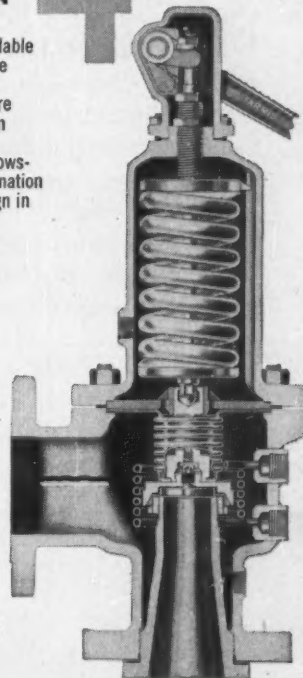


3



BELLOWS— HEAT EXCHANGER COMBINATION

For completely dependable valve operation in spite of sticky fluids (tars, asphalt, etc.) and where complete freedom from contamination is required, select the Bellows-Heat Exchanger combination . . . The ultimate design in safety relief valves for applications where material is highly viscous. All parts are Farris Standard construction.



*** CERTIFIED AND APPROVED** by the National Board of Boiler and Pressure Vessel Inspectors, complying with ASME requirements. Tests made at university laboratories by independent observers. Certification data available on request.

*and Still the
Lowest Prices
in the industry!*

Coming Soon!

An added line of
ultimate capacity
nozzle valves

Farris

ENGINEERING CORPORATION

405 COMMERCIAL AVENUE, PALISADES PARK, NEW JERSEY

Affiliates: Farris Flexible Valve Corp. • Farris Stäcon Corp. • Farris HydroTorque Corp.

Farris HydroSeal Corp. • Farris Pickering Governor Co.

Stainless Steel equipment helps J. T. Baker Chemical Co. maintain product purity

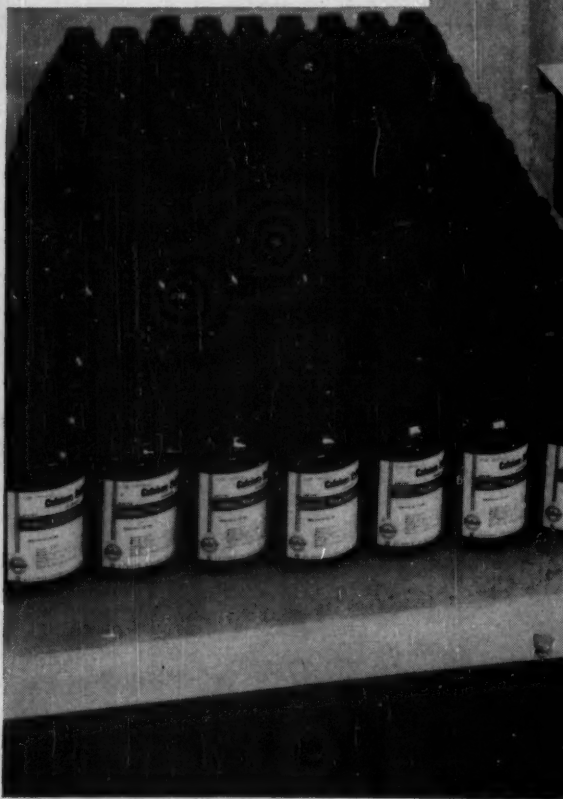
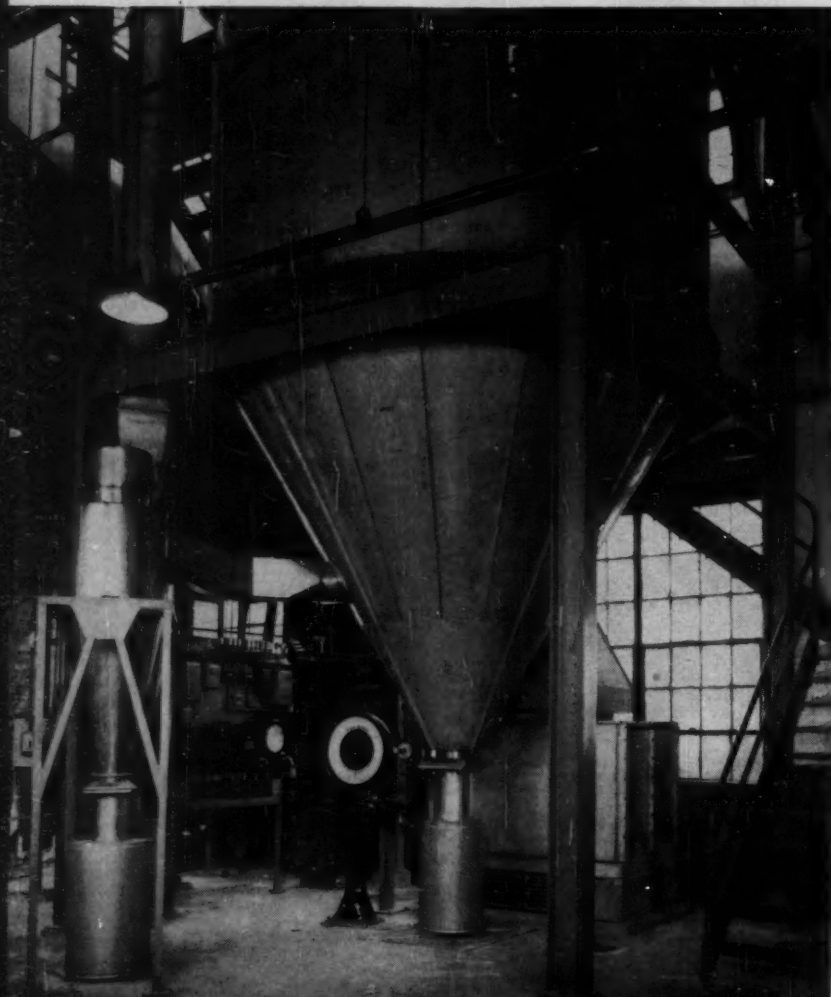
FOR 50 years, the J. T. Baker Chemical Co., Phillipsburg, N. J., has been supplying "Baker Analyzed" Reagents and other laboratory chemicals to industrial, pharmaceutical and educational users. Commercial quantities of Baker Chemicals are used in the pharmaceutical, electronics, photographic film, color and other key industries having specialized requirements for chemical purity.

The company has built its reputation on the purity and precision of its products and takes every precaution to insure these qualities. That's why Stainless Steel is used at all critical points in processing such chemicals as nitrates, acetates, sulfates, chromates, phosphates, carbonates and molybdates.

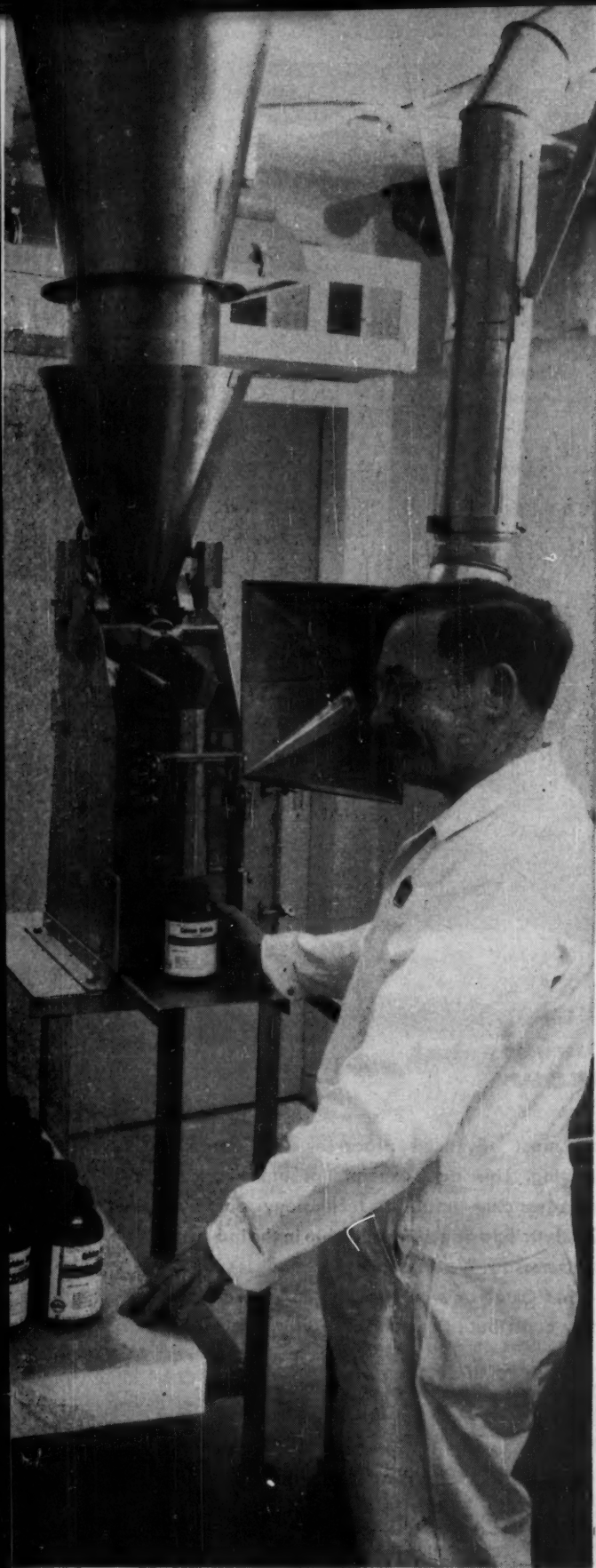
Stainless Steel is used in filters, pumps, reactors, pipes, valves, fittings and storage tanks. Even the ventilating system equipment in temperature and humidity-controlled rooms is Stainless Steel.

Company officials have found that Stainless Steel not only guards purity better and is easier to clean and keep clean, but it also has a life expectancy of 6 to 1 over other commonly-used materials.

If you are not taking full advantage of these qualities of Stainless Steel in your operations, investigate today. And when you purchase Stainless equipment, be sure to specify perfected, service-tested USS Stainless Steel; it is made to give you the finest performance.



STAINLESS STEEL spray dryers are used to dry many of the pure chemicals produced by Baker.



PACKAGING REAGENTS under controlled conditions of temperature and humidity. Stainless Steel automatic dispensing equipment fabricated by Exact Weight Scale Company, Columbus, Ohio.



FOR ABSOLUTE UNIFORMITY, Baker chemicals are blended in Stainless Steel double-cone tumblers with capacities up to 10,000 pounds. This tumbler was fabricated by Blaw-Knox Company, Pittsburgh, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS STAINLESS STEEL

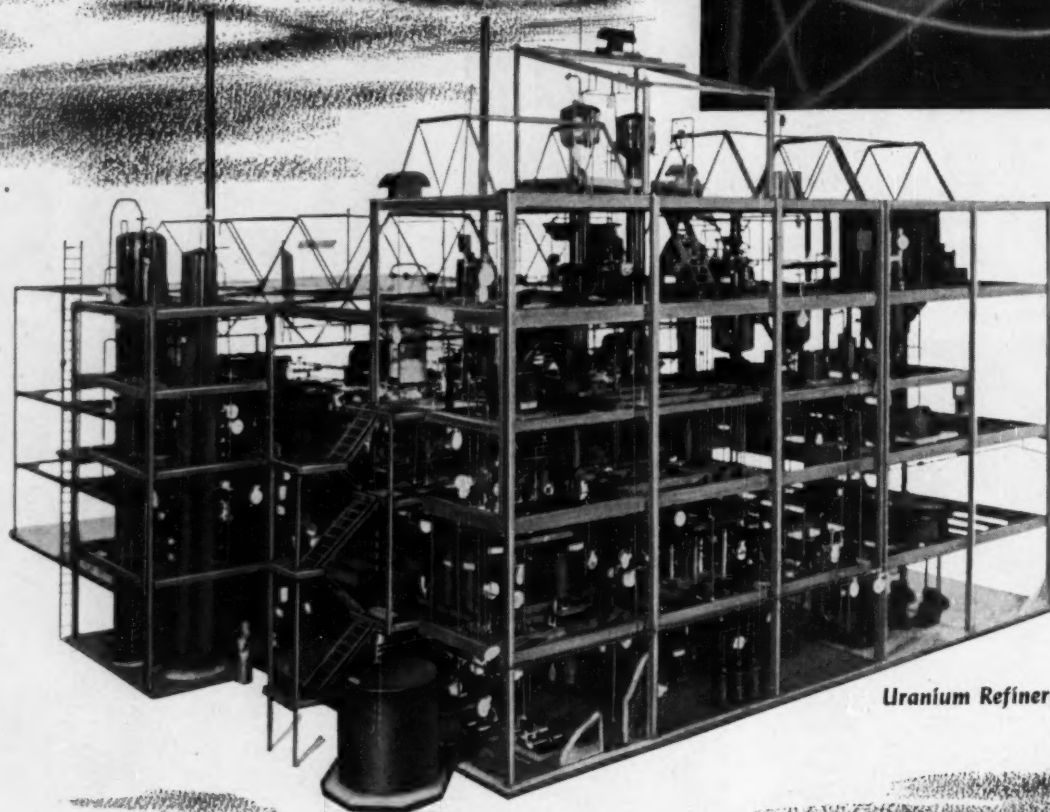
SHEETS • STRIP • PLATES
TUBES • WIRE



BAR • BILLETS • PIPE
SPECIAL SECTIONS

4-1859

UNITED STATES STEEL



Uranium Refinery

MODEL for Tomorrow

The full scale commercial uranium refining plant—of which this is a model—is now under construction at Port Hope, Ontario, and will be completed in 1955, the first of its kind in Canada. With engineering and construction by Catalytic, it will make available to Eldorado Mining and Refining, Limited (a Crown Company)

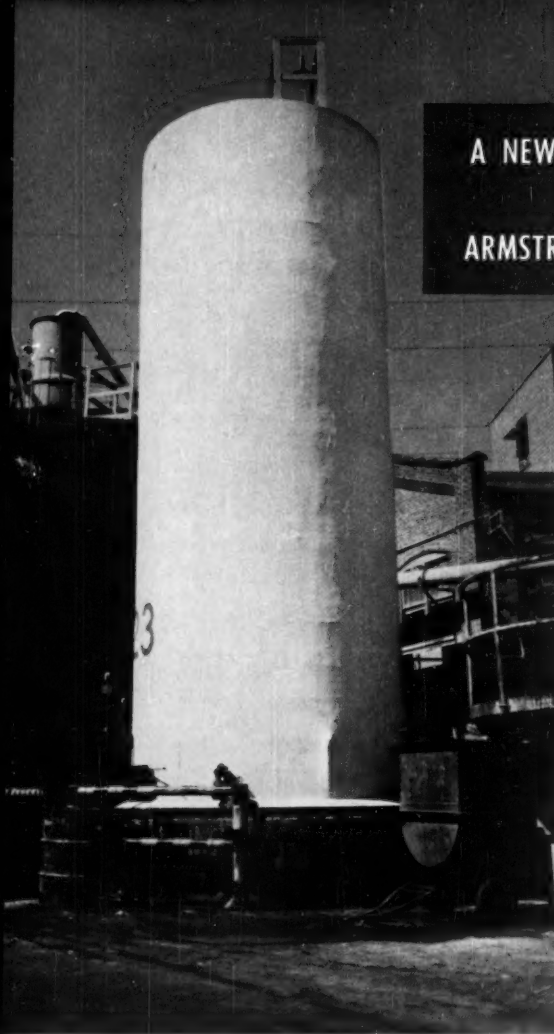
the most advanced processes for uranium refining. This new example of our services in advancing uranium technology portrays Catalytic's position of leadership in the industry of tomorrow. We welcome your inquiries today—that Catalytic's on-time, on-budget services may contribute to your success of tomorrow.

CATALYTIC ON-TIME...ON-BUDGET SERVICES
for the atomic energy, chemical, petrochemical and oil refining industries • Project Analysis • Process Design • Economic Studies • Engineering • Procurement • Construction • Plant Operation

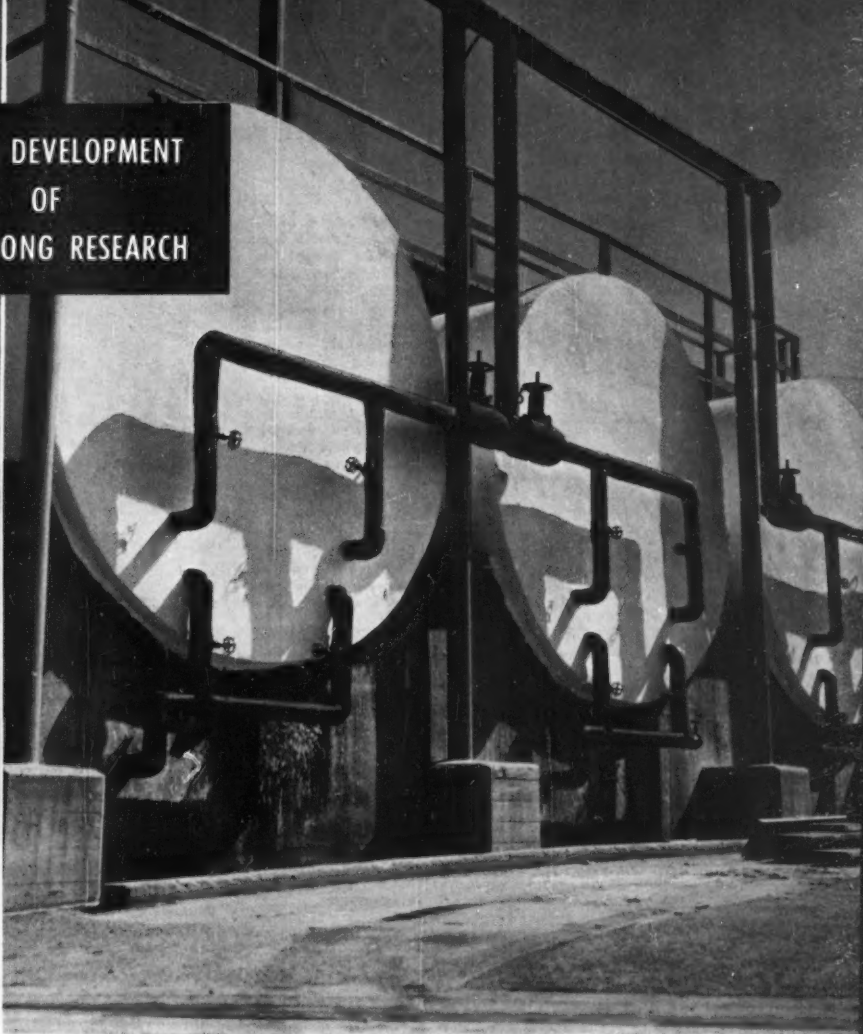


CATALYTIC
CONSTRUCTION COMPANY
1528 Walnut St., Philadelphia 2, Pa.

In Canada:
CATALYTIC CONSTRUCTION
OF CANADA Limited



A NEW DEVELOPMENT
OF
ARMSTRONG RESEARCH



Insulcolor ... a rugged plastic finish for insulation— indoors and outdoors

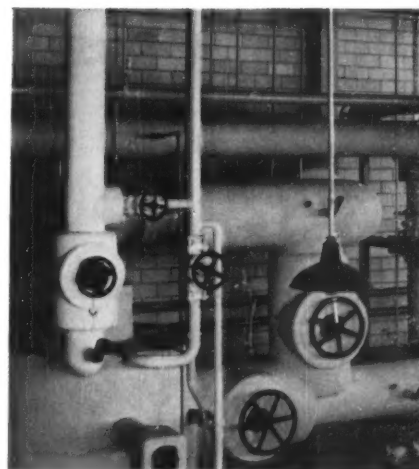
Now you can apply a protective finish to insulated tanks and lines that serves as color identification, too. New Armstrong Insulcolor provides a durable plastic finish in seven colors or white.

Under the most severe outdoor conditions, Insulcolor* will not crack, craze, or peel. The rugged plastic film withstands extremes of temperature and has excellent water-resisting properties. Bumping and abrasion won't damage Insulcolor's smooth, tough surface.

Used indoors, Armstrong Insulcolor is both finish and color key for all insulated steam, refrigerant, and cold

water lines. It is also being widely used over cork insulation on equipment, air-conditioning ducts, and in cold rooms. Insulcolor is quickly and easily applied by brush or spray gun. It requires little or no maintenance.

Available through Armstrong's Contract Service, Insulcolor is one of the new products developed by Armstrong Research in the industrial insulation field. For full details on Insulcolor and Armstrong's Insulation Contract Service, call your nearest Armstrong office or write Armstrong Cork Company, 205 Stratton Street, Lancaster, Pennsylvania.

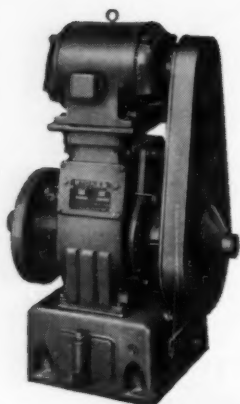


Both insulation finish and code color, Insulcolor eliminates stenciling or the extra expense of painting lines with identifying colors after the finish has been applied.

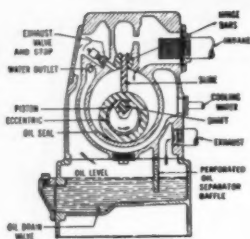
*Trade-mark

Armstrong INDUSTRIAL INSULATIONS

Cut Costs...Boost Efficiency...with Stokes High Vacuum Pumps



At left is the new Model G Stokes High Vacuum Pump. Basically, and in outward appearance, the new model is the same simple, efficient, compact and reliable unit as its widely used predecessor, Model F. Five major engineering improvements are incorporated in the new model: 1) a new mechanical face-seal minimizes routine maintenance and reduces to a minimum the possibility of oil leakage at the shaft; 2) new exhaust valve-stops permit use of these pumps in an exceptionally broad range of applications, including rapid cycling evacuation of large-volume systems; 3) a new intake screen filter prevents damage by dirt, scale, and other solids sometimes present in the system; 4) a new oil filter in the line to the shaft seal affords special protection to the bearings at these points; 5) a new solenoid valve in the oil supply line automatically prevents oil-flooding of the pump in the event of power failure.



The operating principles of the Stokes High Vacuum Pump are simple. Rotation of the Stokes Pump is indicated in cross-section view at left: Air enters the increasing space at right of piston, while air trapped in the decreasing space at left of piston is compressed. As piston nears top of stroke, pressure of the trapped air opens the feather-type discharge valve against atmospheric pressure, and the air is forced out of the cylinder. As piston passes through its top position, the suction port is momentarily closed by piston. Air then present in cylinder is trapped, a new cycle begins.



A completely revised brochure on Stokes High Vacuum Pumps is now available, free, upon request. It explains, and shows, how Stokes Pumps combine simplicity of design, high volumetric efficiency and lowest operating costs to provide reliable, continuous service for all kinds of high vacuum processing equipment. Examples of typical vacuum systems using Stokes Pumps are cited and typical problems in pump selection and their solution are provided. Also described is the complete line of Stokes High Vacuum Processing Equipment and the new Stokes Experimental and Applications Laboratory in Philadelphia, Penna.



The new Stokes Vacuum Calculator for rapid slide-rule vacuum calculations, including a standard ABCD log scale, is now available, free, upon request. It has proved to be of tremendous value to those engaged in vacuum research and processing. Simplifies determination of pump capacity required for given volume in given time or given volume to specified vacuum with user's present equipment. Numerous tables on reverse face provide useful vacuum reference data.



Send for copy of a new handbook "How to Care for Your Vacuum Pump." (Bulletin No. 755). Contains many valuable suggestions about installation, starting, servicing, trouble-shooting; and helpful "Do's" and "Don't's" on vacuum pumps and vacuum pumping systems.

Simplicity and sturdy construction, accessibility, high volumetric efficiency, low power consumption, and effective cooling are distinctive features of Stokes High Vacuum Pumps.

Better blank-off pressures and quieter operation are assured with a completely new, longer lasting exhaust valve assembly. Intake ports are open during the entire intake cycle; there is no slide-valve shut-off.

Lubrication is completely automatic. There are no oil shut-off valves and adjustments. Horizontal vacuum intake permits trapping of harmful dirt and scale. Vacuum-tight rotary seals eliminate the need for shaft packing and constant adjustment. Easy access is provided to the valve assembly and other parts requiring periodic examination.

Stokes High Vacuum Pumps are available in capacities from 15 to 500 cfm. Where necessary, oil purification units — to assure continuous supply of clean, water-free oil — can also be furnished.

Wherever hard, continuous service is required to meet today's exacting high vacuum requirements, Stokes High Vacuum Pumps prove a profitable investment.

Consult with Stokes on the application of vacuum to drying, freeze-drying, impregnation, extraction, solvent recovery, evaporation, vacuum metallizing, and to other purposes for which vacuum deserves exploration.


F. J. STOKES MACHINE COMPANY
PHILADELPHIA 20, PA.



WOLVERINE TRUFIN*

TYPE S/T

Offers Opportunity to Step up Capacity of Propane Condensers

- 
1. Trufin Type S/T—is mechanically interchangeable, can be fabricated in shell and tube heat exchangers in the same manner as prime surface condenser tubing.
 2. Integral Fin Construction—gives maximum heat transfer performance regardless of vibration or temperature fluctuations.
 3. Surface — Trufin provides more than double the outside surface of prime surface tubing in a given shell diameter.
 4. Standard gage — dimensions are controlled at fin section so that standard gage can be used in design.
 5. Heavier gage — at the plain end provides added protection against inlet erosion, facilitates "rolling-in" operations.
 6. Trufin Type S/T condenser tubing—can be furnished in a wide range of sizes, in copper, copper-base alloys, aluminum and steel.

Processing engineers are discovering—in Trufin—the help they need to keep pace with today's soaring production demands.

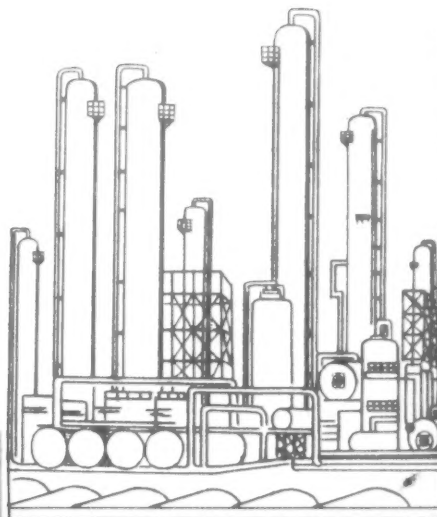
The Trufin story, actual case histories, complete with valuable design information, is told in its entirety in the new Wolverine Trufin Opportunity Book. Write for your copy—TODAY.

Second in a series of advertisements designed to show new opportunities in heat exchange.

You can step up the heat duty—in existing equipment — when you retube with Wolverine Trufin Type S/T condenser tubing. It's as simple as that.

Trufin Type S/T has integral fins squeezed directly from the tube wall and is specifically designed for shell and tube heat exchangers. One of its most ideal applications is found in propane condensing operations.

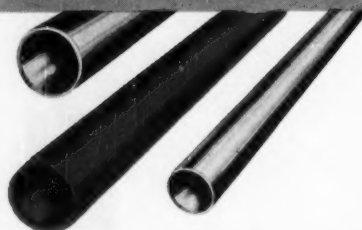
Study the six Trufin features listed at left. They emphasize Trufin's unique construction and show how to bring new heights of efficiency and new economy to heat exchangers and condensers.



IT PAYS TO SWITCH TO WOLVERINE

Trufin Type S/T is only part of the complete line of condenser tube products at Wolverine. Here is the rest of the cost-saving lineup:

PRIME SURFACE TUBING



To meet varied corrosive conditions Wolverine produces prime surface tubing in a complete size range in copper, copper-base alloys, aluminum and electric-welded steel.

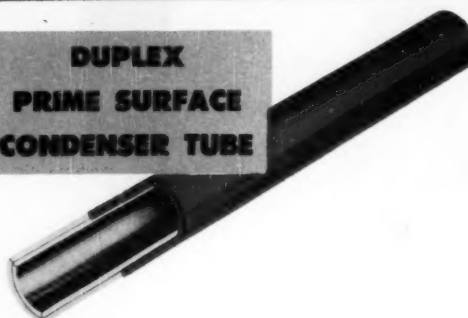


U-BEND PALLETS



Prearranged to your prints, prime surface or finned tube U-bends come to you in a disposable box-type pallet. U-bends are fed directly from pallet to heat exchanger—save time and money, reduce storage space and inventories.

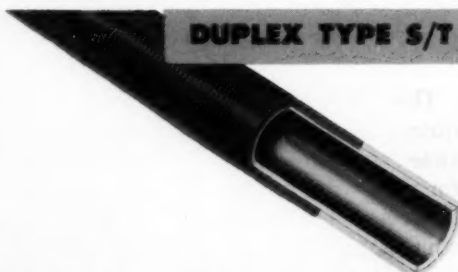
DUPLEX PRIME SURFACE CONDENSER TUBE



Wolverine Duplex Prime surface Tube consists of tubes of two entirely different alloys. Shown is welded steel tube with a liner of inhibited Admiralty—metals and alloys are selected on the basis of the type of corrosion expected.



DUPLEX TYPE S/T



Duplex Type S/T not only withstands two different types of corrosion, but because of its integral fins it also boosts heat exchanger capacity. It has a plain end slightly larger than the O.D. of the fins to simplify rolling into headers.

WOLVERINE TRUFIN* TYPE L/C



This is a bi-metal tube with an exterior of lightweight, high-finned aluminum available with liners of copper, copper-base alloy, or steel. Trufin Type L/C withstands corrosion, provides maximum heat transfer over a long period of time.

Wolverine Trufin is available in Canada through the Unifin Tube Company, London, Ontario.

Yes, Wolverine produces condenser tubing in several metals and alloys—each designed to resist the particular type of corrosion problem you face. Write today for a copy of the Wolverine Corrosion Chart. It has information you need! WOLVERINE TUBE, 1443 Central Avenue, Detroit 9, Michigan.

*REGISTERED U.S. PATENT OFFICE

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPT., 13 E. 40TH ST., NEW YORK 16, N. Y.



WOLVERINE TUBE

DIVISION OF CALUMET & HECLA, INC.

*Manufacturers of Quality-Controlled Tubing
and Extruded Aluminum Shapes*



Over 2 yards of clay in the bucket of this 1-yard MICHIGAN, owned by Leonard Elam, Gardner, Illinois

Get a Bonus in Every Bucket!

— with a **MICHIGAN**

Notice two facts about this operation:

1 More than 3 yards in that 2¼ yard capacity bucket—a 100% bonus load!

The independent bucket control on MICHIGAN tractor shovels makes this kind of performance possible. Two powerful double-acting cylinders on the MICHIGAN bucket provide tremendous break-out power, enable the operator to "work" the bucket while it's buried deep in the pile. His bucket-control lever *over-rides* the boom-hoist, so he doesn't have to lift the bucket out of the pile *until* he's got a heaping bonus-load.

2 All wheels solidly on the ground!

Here's proof of the MICHIGAN'S bonus margin of weight distribution. These are the heaviest, most powerful tractor shovels on the market today. Even with a 100% bonus bucket load, you still have complete stability and traction.

One brief demonstration will convince you quickly that you'll get a Bonus Bucket every time with a MICHIGAN Tractor Shovel—for more yardage moved, in fastest time, at lowest cost. Such a test is easy to arrange—simply call your nearby MICHIGAN distributor; or use the coupon. MICHIGAN Tractor Shovels are available under the Clark leasing Plan—we'll be glad to send you details.

**CLARK
EQUIPMENT**

CLARK EQUIPMENT COMPANY
Construction Machinery Division
432 Second Street
Benton Harbor, Michigan

23

What's this about demonstrating the MICHIGAN Tractor Shovel?

Also, send us ☐ Specifications . . . and ☐ Lease Plan data sheet

Name _____

Firm _____

Title _____

Address _____

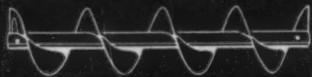
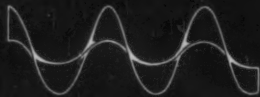


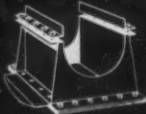

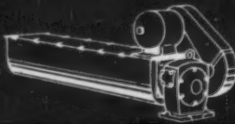
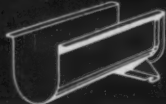
City _____

County _____

State _____

When you buy screw conveyors... rate them against this quality chart

Only LINK-BELT gives you all these performance extras

ACCURATELY FORMED FLIGHTING		Link-Belt's specialized machinery assures accurate forming, producing uniformity of flighting curvature.
UNIFORM DIAMETERS		Only specially selected steels are used to meet Link-Belt's rigid specifications.
WIDE RANGE OF HANGERS		Hangers are available in a wide range of styles and mountings with various bearing materials.
EASY ASSEMBLY		Straightness is checked before shipping, and extra care is taken in handling and loading. Jig-drilled coupling bolt holes facilitate assembly.
ON-THE-JOB DISCHARGE OPENING LOCATION		For versatility in locating discharge openings, Link-Belt offers spouts and gates that can be easily installed on the job and bolted or welded in place.
CHOICE OF SPOUTS, GATES		Wide range of fixed or detachable plain discharge spouts or gates. Flat or curved slide type gates can be hand or rack-and-pinion operated.
FULLY INTEGRATED DRIVES		Only Link-Belt builds a complete, pre-integrated line of gear and chain drives, couplings, bearings. One proved source... one undivided responsibility.
ACCURATELY FABRICATED TROUGH		Added refinements of manufacture assure better fit of all components. And Link-Belt offers you a choice of metals to fit your particular application.



These are only a few of the many important performance extras you get with Link-Belt screw conveyors. Ask your Link-Belt representative or authorized stock carrying distributor for 92-page Data Book 2289.

LINK-BELT
SCREW CONVEYORS

13, 677



LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarborough (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

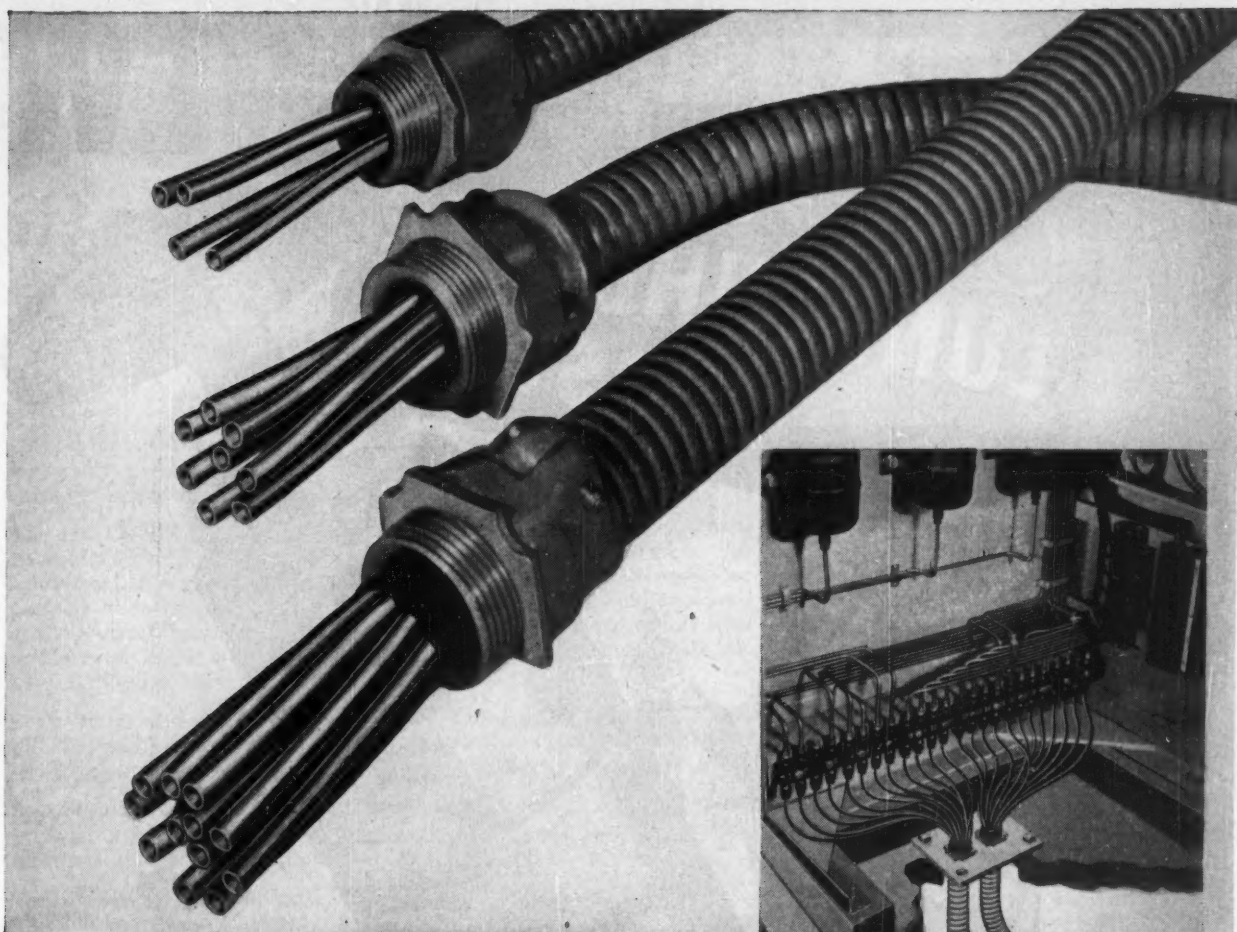


PHOTO above shows 4-, 8- and 12-tube ARMORTUBE cable. Drawing at right shows the application of Bailey ARMORTUBE cable for making connections to a Control Panel.

TO MAKE ARMORTUBE CABLE...

Bailey Meter Company turns to Anaconda for long lengths of 1/4" O. D. copper tubes

Bailey Meter Co., Cleveland, Ohio, calls its ARMORTUBE Flexible Protected Tube Cable, "the modern shortcut to simpler, safer, more economical air and hydraulic circuits."

As shown above, this cable is available in bundles of four, eight or twelve 1/4" O.D. copper tubes. A continuous, heavy galvanized steel strip protects the tube bundle.

Here's why Bailey turned to Anaconda as the logical source of supply for these 1/4" O.D. copper tubes.

LONG LENGTHS

Because ARMORTUBE cable is shipped in random lengths of about 500 feet, Bailey needed long lengths of copper tube. Anaconda makes copper tube up

to 2,400 feet long, depending on the diameter.

CLEAN INTERIORS

These tubes had to be free from dust, dirt or metal chips which might otherwise interfere with the operation of delicate air and hydraulic circuits. Anaconda takes special care to see that inside surfaces of ANACONDA Copper Tubes are clean, smooth and bright. Tube ends are sealed to keep out moisture and foreign matter during storage.

FLEXIBLE

Tubes had to be flexible enough to bend around corners and obstacles. ANACONDA Copper Tubes are uniformly soft... highly flexible. And they are accurate in size and shape.

ANACONDA Dehydrated Copper Tubes are made in all standard sizes up to and including 3/4" O.D. Usually furnished in 25-, 50- and 100-foot coils, they are also available in longer lengths on spools and reels where required.

Our Technical Department will be happy to lend a hand on any problem involving the use of copper tubes. A letter outlining your problem will bring a prompt answer. Write to: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

24158

ANACONDA®
COPPER TUBES

ANNOUNCING

NEW

Another
LUNKENHEIMER
"FIRST"...



Fig. 2600

LUNKEN

THE ONE

Great

LUNCOR

Valves and Fittings

The Lunkenheimer PVC Valve resistant to industrial chemicals!

You can cut your corrosive fluid handling costs with the first all-plastic valve designed and engineered by a valve manufacturer!

The new LUNCOR Valve, by Lunkenheimer, is made of rigid, unplasticized PVC. Every part is completely molded — body, bonnet, stem, and handwheel. The molding process not only gives it amazing strength, but protects its resistance to corrosion. You get time-tested Lunkenheimer quality — at surprising savings. If you have been using stainless steel or alloy valves for corrosive service, it will pay you to investigate the new LUNCOR Valve and Fittings . . . now.

Basic material used for the LUNCOR Valve is polyvinyl chloride (PVC), which resists most industrial chemicals. It is recommended for service at pressures up to 125 psi and temperatures up to 140°F.

A complete line of LUNCOR PVC Fittings is also available from Lunkenheimer — 45° and 90° elbows, tees, flanges, unions, reducing bushings, caps, couplings, and plugs.

For full details, call your local Lunkenheimer Distributor, or write The Lunkenheimer Company, Box 360, Cincinnati 14, Ohio.



HEIMER

NAME IN VALVES

Squeeze refrigeration costs with closer temperature approaches

*Obtain 5°F. or closer with Trane
Brazed Aluminum Heat Exchangers*

Now, even when *large* heat transfer duties are involved, you can obtain temperature approaches of 5 degrees F. or closer! That means *less* refrigeration is required to bring a specified liquid or gas to desired temperature. Operating costs go *down*! You squeeze *more* out of every heat exchange dollar.

What's more, TRANE Brazed Aluminum heat transfer surface makes it *practical*!

TRANE Brazed Aluminum Heat Exchangers can pack up to 450 square feet of heat transfer surface into a single cubic foot. In fact, TRANE Brazed Aluminum Exchangers can occupy as little as *one-third* the space, can weigh as little as *one-fourth* as much as conventional exchangers . . . and can cost less!

Yet for all their lightness, compactness and low cost, TRANE Brazed Aluminum units withstand test pressures up to 1,000 psi. Installation costs are lower, too . . . maintenance greatly simplified.

Lower costs **plus** the ability to perform efficiently and economically at temperatures as low as -350 degrees F. explain why TRANE Brazed Aluminum Exchangers of the type shown at right are used by so many firms for oxygen and ammonia processing and similar uses.

If you have a heat transfer problem involving *close temperature approaches*, *multi-stream exchange* or *low temperatures*, it's time to call TRANE.

Our 30 years' experience in heat transfer is at your disposal. Just contact your nearest TRANE Sales Office or write on company letterhead to TRANE, La Crosse, Wis.

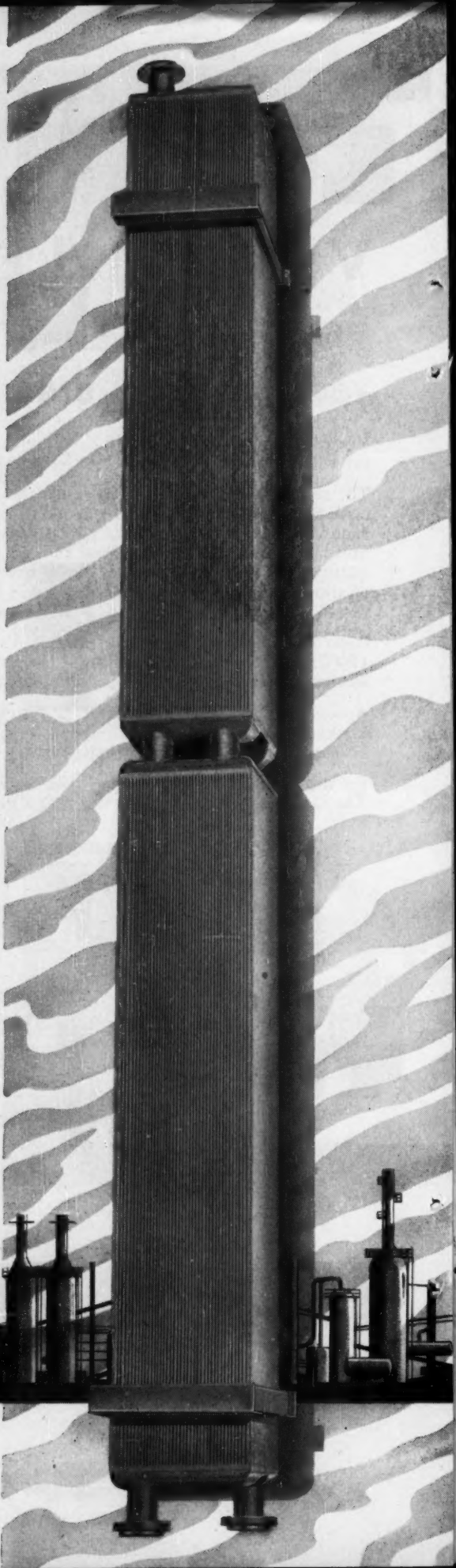
Specify

TRANE

Brazed Aluminum Heat Exchangers
for close temperature approaches!

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING,
VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa.
Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 15 Canadian Offices.






CLEAVER-BROOKS SELF-CONTAINED BOILERS HAVE THE FEATURES EVERYONE WANTS!

...which feature would be most important to you?



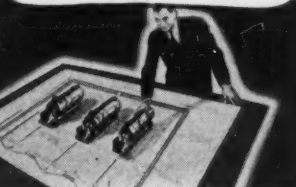

PLANT OWNER

- "Cleaver-Brooks boilers are tops in fuel economy! Forced-draft, four-pass construction and 5 sq. ft. of heating surface per boiler H.P. assure me 80% operating efficiency when firing with oil."

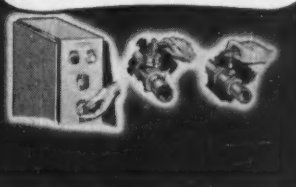
ARCHITECT

- "Self-contained design certainly simplifies boiler room planning — gives owners maximum use from each square foot of space. Gives me flexibility to make best use of low head room conditions."

CONSULTING ENGINEER

- "Oil, gas and combination oil/gas firing lets me recommend Cleaver-Brooks boilers for installation anywhere. Exclusive burner design makes it possible to interchange gas/oil firing in 10 seconds."





CONTRACTOR

- "Boilers are shipped ready to install. With service lines in, my crews have boilers ready for operation in 24 hours or less after delivery. No foundation or stack problems. Cleaver-Brooks furnishes starting service, too."



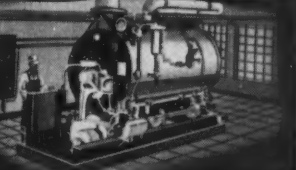
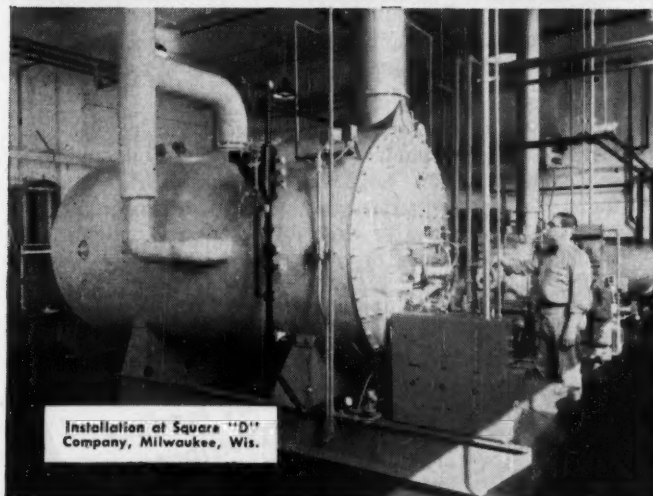

PLANT SUPERINTENDENT

- "I get all the steam I need for fluctuating steam demands, from full load down to 30% of rating. Automatic burner controls assure instant firing. I call that real dependability."

OPERATING ENGINEER

- "Cleaver-Brooks boilers sure are simple to maintain. No more smoke, ashes, clinkers or messy boiler-room conditions. What's more, I get performance I can count on — backed by factory and on-job tests."

Installation at Square "D" Company, Milwaukee, Wis.

THESE are just a few of the many outstanding features that have made more than 15,000 individual Cleaver-Brooks self-contained boilers *first choice* for commercial, institutional and industrial applications. Get in touch with your nearest Cleaver-Brooks representative for complete facts, or write for catalog AD-100. Cleaver-Brooks Co., Dept. B-345 E. Keefe Ave., Milwaukee 12, Wis., U.S.A. — Cable address: **CLEBRO** — Milwaukee — all codes.

Cleaver Brooks

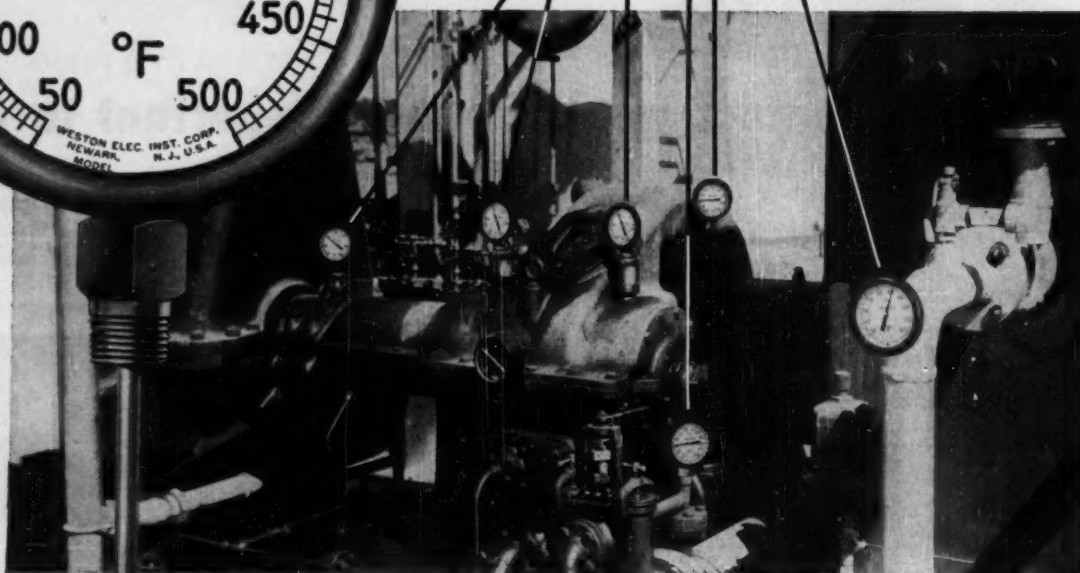
"It's NEW — get the facts on the CB boiler — write today!"

BOILERS — STEAM OR HOT WATER — FOR HEATING OR PROCESSING IN SIZES FROM 15 TO 500 HP, 15 TO 250 PSI.

NOW — FIRST SIZES OF THE CB BOILER ARE MADE IN CANADA, TOO.



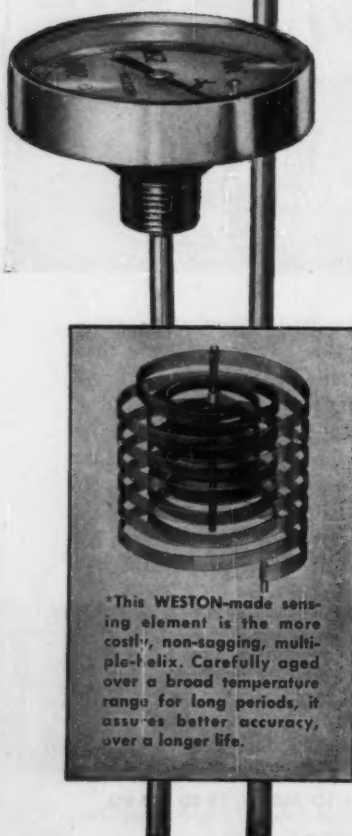
**AT EVERY
CHECKPOINT**



WESTON *all-metal* THERMOMETERS (with Multiple Helix*)

Here's another typical example of how large processing plants have solved temperature checking problems, and cut thermometer costs besides. With a WESTON dial-type thermometer at every checkpoint, temperatures are read at a glance . . . in far less time, and with far greater accuracy. Their sturdy all-metal construction resists breakage, gives them far longer life on operating equipment. And the exclusive WESTON multiple helix employed assures dependable accuracy during all this long life.

Available in a broad selection of types, sizes, ranges and stem lengths, WESTON thermometers are today standard on all types of mobile and stationary equipment and machines, large and small; as well as on piping, conduit, ducts, etc. Ask your distributor, or local WESTON representative for complete information, or write for descriptive bulletin . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.



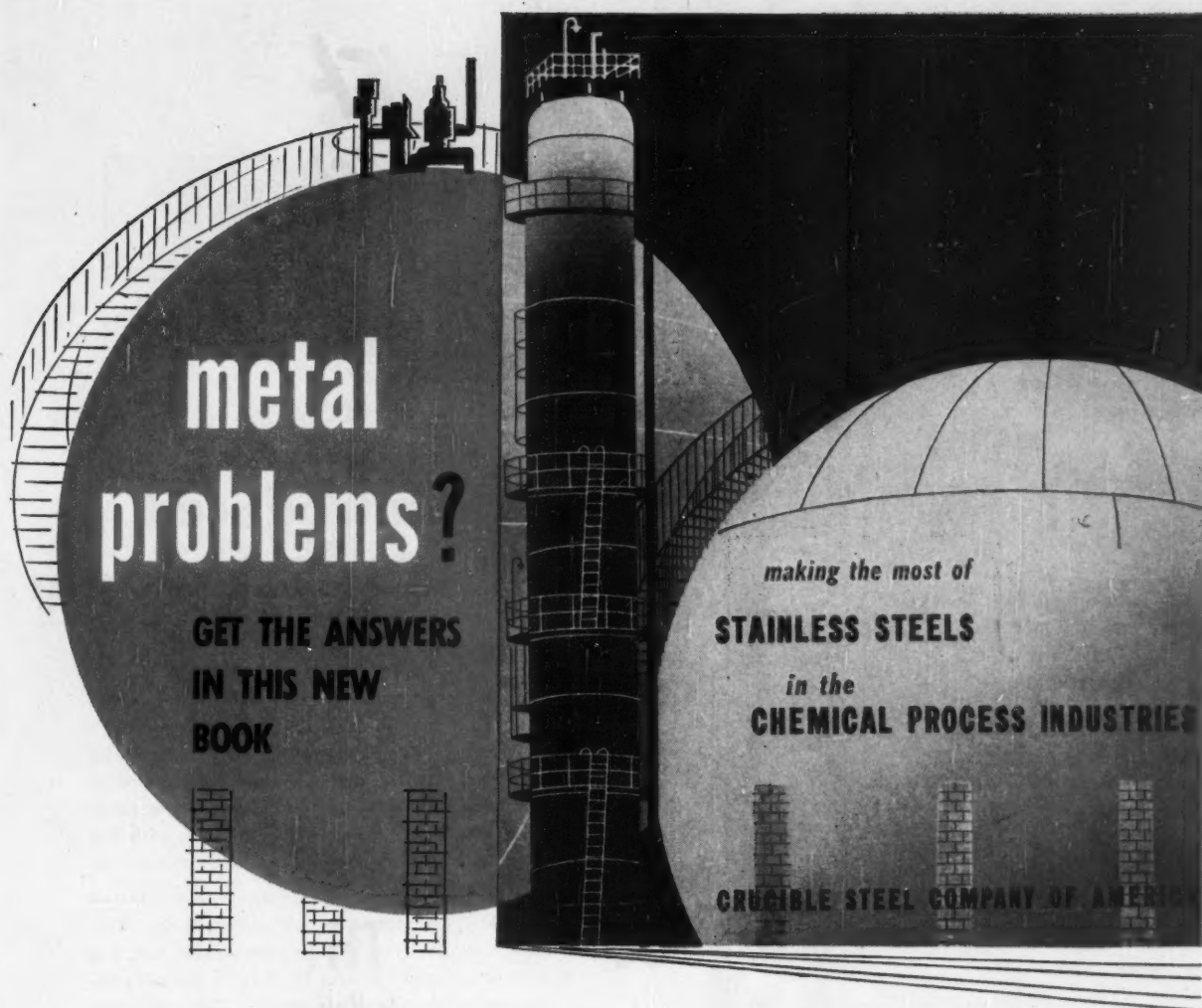
*This WESTON-made sensing element is the more costly, non-sagging, multiple-helix. Carefully aged over a broad temperature range for long periods, it assures better accuracy, over a longer life.

WESTON

5537

Thermometers

Stocked
by leading
Distributors



Here's a handbook that's full of vital information on how stainless steel pays its way over and over again in the process industries.

For Crucible Rezistal® stainless steels are produced in many grades, all of which offer, in addition to corrosion resistance, a combination of several important properties — ease of cleaning, resistance to heat and cold, structural strength, and wear and abrasion resistance. By sensible selection of the proper Crucible stainless grade, you can achieve longer equipment life and more economical operation.

This 44-page Crucible book is full of information that you can use in your daily work. Get your copy now. Just clip and mail the coupon.

Crucible Steel Company of America
Dept. CE, Henry W. Oliver Building
Pittsburgh, Pa.

Please send me a copy of
"Making the Most of Stainless Steels in the Chemical Process Industries"

Name _____ Title _____

Company _____

Address _____ City _____ State _____

CRUCIBLE

first name in special purpose steels

54 years of *Fine* steelmaking

STAINLESS STEELS.

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

CHEMICAL ENGINEERING—February 1955



K & M introduced the molded diaphragm ... WHY?

Unlike many conventional control valve diaphragms, K & M contour molded diaphragms maintain a *constant effective area* throughout the entire range of valve stem travel. Control variations are transmitted to the K & M inner valve without distortion for more accurate, more reliable flow regulation. And, with less possibility of any binding and sticking whatsoever.

Furthermore, the effective area of the K & M contour molded diaphragm is particularly large. This greater area, combined with long stem travel, enables K & M Diaphragm Motors to provide virtually the highest "power factor" available. Thus, not only is the inner valve positioned more accurately, but sensitivity of response is also increased.

To assure long term service under the toughest operating conditions, all K & M diaphragms are molded of tough, inert neoprene and fabric reinforced.

In addition to contour molded diaphragms, K & M Control Valves incorporate other unique operating advantages, such as all steel topworks construction with open-yoke design, and the two-bolt patented continuous seal method for positive diaphragm casing closure.

WRITE FOR YOUR COPY of the new K & M Valve Engineering Data Catalog, Bulletin CV53.
NEW . . . Valve Size Slide Rule Calculator with LOW FLOW DATA.
Available upon request.

KIELEY & MUELLER, INC.

diaphragm control valves



64 Genung Street
Middletown, New York

Valve Makers
Since 1879



Low-cost "Virginia" Liquid Sulfur Dioxide (SO_2) has met the rigorous requirements of over 40 diversified industries. Our staff has successfully cooperated in applying it to products or processes—as a reducing, bleaching, neutralizing, or preservative agent; reaction medium, pH control or antichlor.

"Virginia's" position as America's Number One producer of SO_2 largely stems from 35 years of accumulated know-how always available to our customers, plus unequaled production and shipping facilities, which always

assure prompt and dependable deliveries in any quantity—a pound or a tank car.

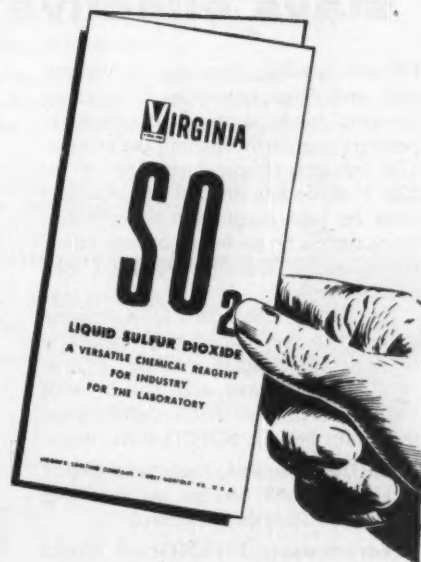
If there's the remotest possibility that an application of our SO_2 can save you time or money, improve efficiency, or upgrade products in your plant or mill, we'd like to look into it. Send today for our SO_2 folder—or ask to have one of our experienced field men call for consultation.

Industrial Department, VIRGINIA SMELTING COMPANY, Box 21, West Norfolk, Virginia.

VIRGINIA *Chemicals*

Field Offices: NEW YORK • BOSTON • DETROIT • CHICAGO • ATLANTA • ASHEVILLE
Available in Canada and many other countries

CHEMICAL ENGINEERING—February 1955





FOAMGLAS[®]

the cellular, stay-dry insulation

Insulation Contractor: Combustion Equipment & Insulation Co., Cleveland, Ohio

SOHIO gets efficient desalting because . . .

Spillage-proof FOAMGLAS insulation stays effective to hold precise temperature

Efficient electric desalting to remove salts and other impurities from crude charging stocks demands precise temperature control throughout the process. The influent temperature (180° F to 220° F depending on viscosity of crude) must be held constant until effluence. Since there's no exchange of heat inside the sphere, it must be insulated very effectively.

For six years Standard Oil Company (Ohio) has maintained peak desalting efficiency by insulating their spheres in Cleveland, Lima and Toledo with FOAMGLAS. This unique cellular glass insulation benefits SOHIO three ways:

1. **Spillage-proof**, moisture-proof FOAMGLAS retains its insulating value . . . avoids fire hazard.
2. **Easy-to-apply** FOAMGLAS blocks are lightweight but very strong, readily

applied to sphere, eliminating insulation supports.

3. **Effective insulation** holds temperature required for electric field to break continuously the water and oil emulsion. It also prevents temperature drop near vessel wall . . . avoids thermal currents which would interfere with process.

You'll benefit too by using this unique insulation. For more facts please write for booklets on FOAMGLAS for piping or tanks and equipment.

Pittsburgh Corning Corporation

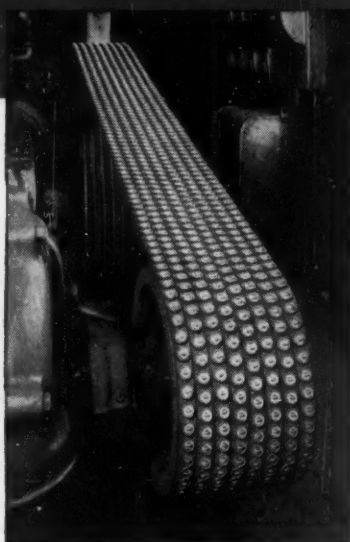
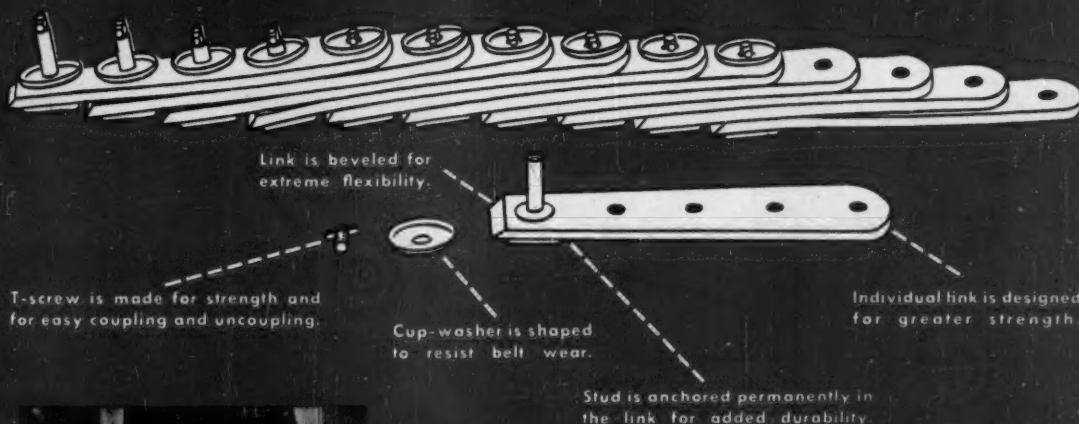
Dept. H-25, One Gateway Center
Pittsburgh 22, Pennsylvania

In Canada: 57 Bloor St. W., Toronto, Ontario

2" thick FOAMGLAS blocks cut to 12 x 12 size were laid diamond shape on SOHIO'S desalter sphere in Toledo. Two Nelson studs were welded through each block and secured with recessed Tinnerman speed clips. After asphalt cutback (Insulmastic 4010)—glass fabric—cutback application, the surface was finished with an asphalt base aluminum paint.



This detailed line drawing of the new, patented Veelos TD and TE v-belt makes it easy to see how this new v-belt is designed to do a better job...easier!



New VEELOS

TD and TE Adjustable V-belt

So easy to couple it installs in minutes
So strong and durable it lasts for years

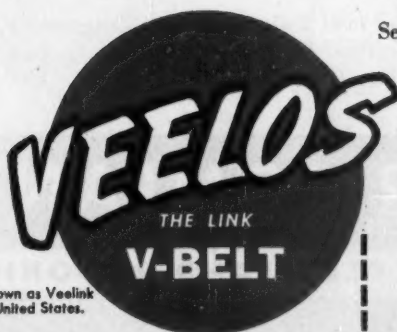
The new Veelos TD and TE adjustable v-belt is the successful development of a specific v-belt designed for a specific service—D and E drives.

This new Veelos TD and TE v-belt has these basic advantages...

It simplifies installation. Links are quickly joined by easy-to-use cup-washers and T-screws to make up individual belts. It's the easiest v-belt to couple and uncouple ever developed. And you don't need to waste time removing outboard bearings.

It lasts longer—is more flexible. New high-tensile strength link combined with new stud, cup-washer, and T-screw gives added durability. New link construction provides maximum flexibility for cooler, wear-resistant running.

Get the complete story of this great new v-belt for D and E drives. Send coupon now for new 8-page illustrated catalog.



Veelos is known as Veelink outside the United States.

MANHEIM MANUFACTURING & BELTING CO.
602 Manbel St., Manheim, Pa.

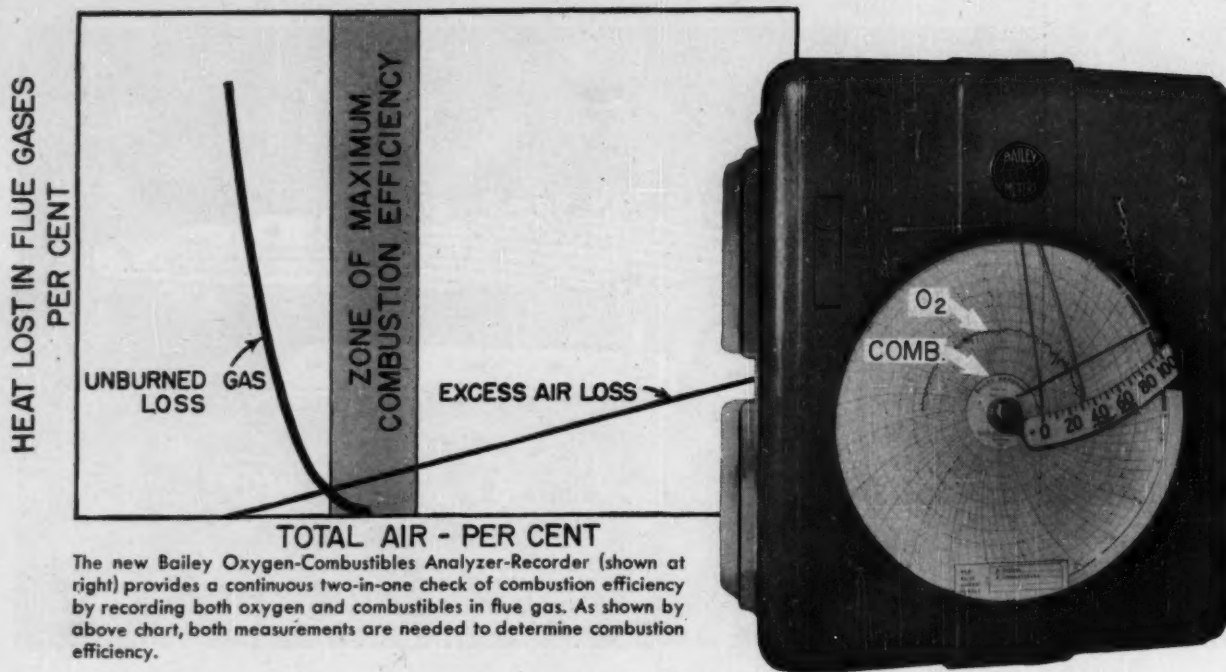
Please send copy of your new Veelos TD and TE v-belt catalog.

Name
Company.....
Address



ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

CHEMICAL ENGINEERING—February 1955



BAILEY announces ... New 2 in 1 way to measure Combustion Efficiency

The new Bailey Oxygen-Combustibles Analyzer-Recorder gives you a continuing double check on combustion economy. It's fast response measures and records:

1. **Excess air**—regardless of the fuel or combinations of fuels being burned.
2. **The mixing efficiency of your fuel-burning equipment**—by indicating the amount of combustibles in your flue gas, resulting from incomplete mixing of fuel and air.

Combustion efficiency depends upon fuel-air ratio. Too much fuel can be even more costly than too much air. And because of the interdependence of these two factors, no control that measures only one of them can give you complete protection.

Now, for the first time, you can check *both* with a *single* fast acting instrument, using the new Bailey Oxygen-Combustibles Analyzer-Recorder for industrial furnaces, kilns, heaters and boilers.

Fuel economy improves as excess air is reduced—until unburned fuel begins to show up in the flue gas. When this happens, combustion efficiency drops off

sharply if there are further decreases in the air-fuel ratio. That's why combustion gases must be analyzed for *both* oxygen and combustibles to get a true indication of efficiency—and that is why Bailey coordinates both measurements on the same chart, to show when excess air may be reduced safely without danger of greater losses from unburned gases.

The Bailey Oxygen-Combustibles Analyzer is an approved combustion safeguard.

Ask your local Bailey engineer for suggestions on application. Equipment details in Product Specifications E65-1 and E12-5. P31-1



BAILEY METER COMPANY

1054 IVANHOE ROAD • CLEVELAND 10, OHIO

INSTRUMENTS
AND CONTROLS

For Power And Process

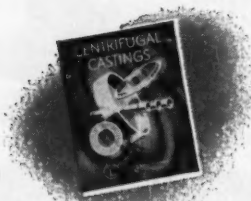
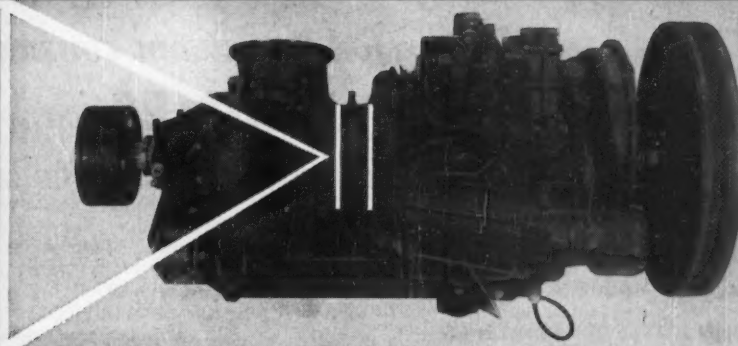
BOEING

chose

LEBANON



...to make the
**STAINLESS STEEL
CASTING** for the
powerplant of a
JET TRUCK



The Lebanon Circle **Ⓛ** Casting in the Boeing 502 Gas Turbine is a product of the Centri-Die process. The complete story of this and other Lebanon Centrifugal Castings is told in a 12-page brochure. Copies are available by writing to William H. Worrlow, Jr., General Sales Manager, Lebanon Steel Foundry, 71 Lehman Street, Lebanon, Pa.

ON the highways of the Far West a 25-ton trailer truck has been powered more than 60,000 miles by a midget engine weighing only 240 pounds!

Midget in size but mighty in power, this revolutionary new power plant is the BOEING 502 Gas Turbine, developed by Boeing Airplane Company as a test model that has wide significance for the entire field of vehicular propulsion.

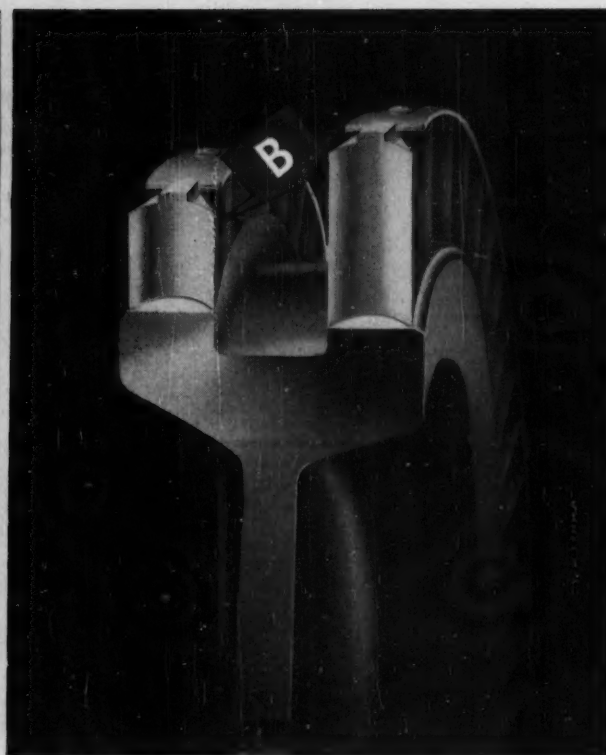
At the heart of the Boeing 502 is heat-searing, power-packed heat of over 1500°. Surrounding, containing and resisting this inferno is a stainless steel casting especially selected for the job—a LEBANON Circle **Ⓛ** Casting, made at Lebanon Steel Foundry by people who, with Boeing, are looking toward the future.



LEBANON STEEL FOUNDRY

LEBANON, PENNA.

Carbon, Low Alloy and Stainless Steel Castings



(Left, A) wide bucket "L" type wheel. (Right, B) regular type wheel for Coppus Steam Turbines

Now...for low steam consumption —
COPPUS TURBINES *can be furnished*
with wide bucket "L" type wheel

Good news for steam turbine users where low steam consumption is important!

The Coppus Type "L" Wheel is the answer to this problem. Larger turbine buckets are employed to make the most economical use of steam.

In every respect the Coppus Turbine offers the top-quality features and advantages that have made the Coppus line outstanding for efficiency and economy. For example:

- Turbines rated close to your exact hp

requirements, from 150 hp down to fractional. No need to buy a bigger, costlier turbine than your conditions call for.

- A larger number of steam nozzles, controlled individually by manually operated valves.

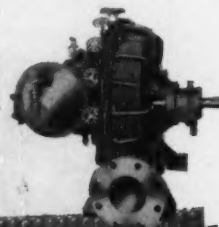
- Exclusive pilot operated excess speed safety trip supplementing constant speed governor.

- Replaceable cartridge type bearing housings.

- Optional carbon ring packing glands.

Coppus Steam Turbines ranging from 150 hp down to fractional, in 6 frame sizes, *make turbine dollars go farther.* Send for Bulletin 135 on Coppus Turbine.

COPPUS
ENGINEERING
CORPORATION
222 Park Avenue
Worcester 2, Mass.
Sales offices in
'THOMAS'
REGISTER



COPPUS "BLUE RIBBON" **TURBINES**

REMARKABLE NEW STEEL

for heavy-duty welded equipment



Strong, tough USS "T-1" Steel
improves performance . . . reduces costs

IN this new engineering material—USS "T-1" Steel—you get a combination of mechanical properties never before obtainable in a single steel.

In "T-1" you get great strength (a yield strength of 90,000 psi.), yet you can fabricate this steel easily and at low cost. You get a steel with good creep and rupture resistance at temperatures as high as 900° F., yet so inherently tough that you can also use it in heavy duty jobs at *sub-zero* temperatures down to -40° F. In "T-1", in brief, you get a steel that withstands severe impact abrasion and, at the same time, resists corrosion at all temperatures.

This unique combination of properties helps you to cut costs and improve performance in an extremely wide range of industrial applications.

"T-1" enables you to reduce the size and weight of heavily stressed or heavily abused parts with no sacrifice in service life or dependability . . . and it enables you to increase the capacity of pressure vessels and storage tanks, to increase allowable working pressure, without increasing weight.

You can use "T-1" Steel to reduce fabricating costs, because you can

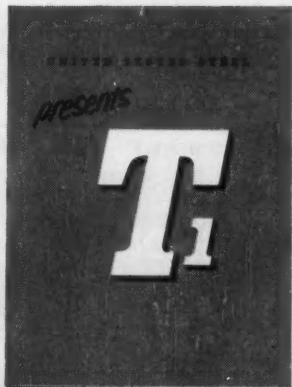
weld it or flame cut it without pre- or post-heating. Heavy duty equipment now can be fabricated either in the shop or the field—wherever it is more convenient and less costly—without the lost time and extra expense involved in heat treatment. Remember, too, when you use "T-1" Steel to reduce the size of welded sections, you cut welding time and the amount of welding rod needed. That's more money saved.

You can use the high-temperature strength of "T-1" Steel to increase the service life of pipes, ducts, and vessels. You can use its amazing sub-zero toughness in equipment that must operate outdoors in the most severe weather. In fact, with "T-1" Steel you can increase the strength, dependability, and safety of heavy duty equipment for use at *any* atmospheric temperature. Send the coupon for complete information.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.

UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.



United States Steel, Room 4621
525 William Penn Place, Pittsburgh 30, Pa.

- ☐ Please send me your booklet
"United States Steel presents T-1"
which contains the full story of T-1 steel.
- ☐ Have your representative get in touch with me.

Name

Address

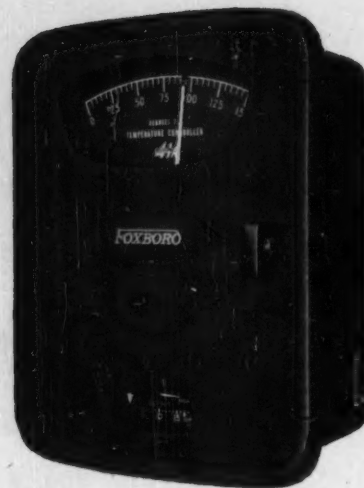
City State



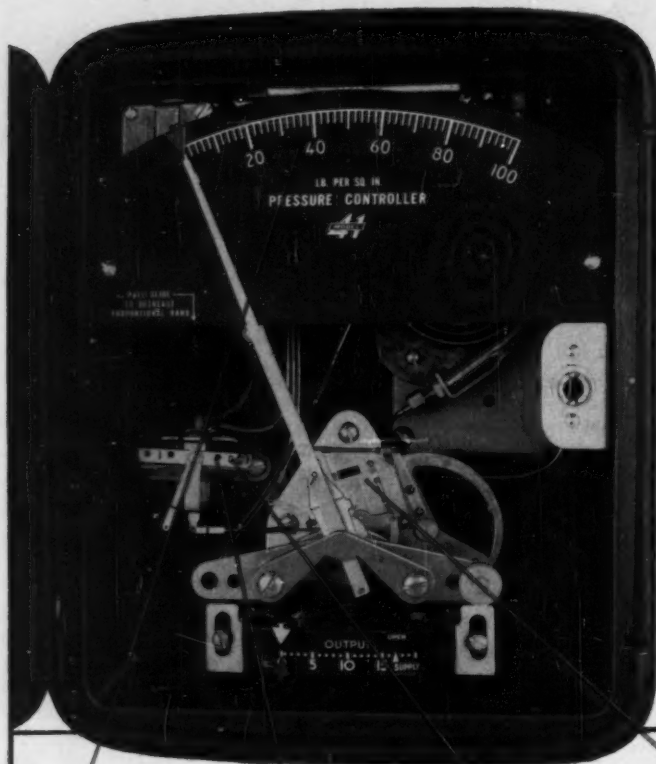
UNITED STATES STEEL

Now!

An even **BETTER** Controller for simple processes!



...the improved Foxboro M/41A Indicating Controller



Here's the Foxboro Controller that proved itself in thousands of successful applications throughout industry! Now, with brand new design features, it's better than ever.

The M/41A Controller offers a new, snappy on-off action, or smooth proportional control action easily adjustable from .25% to 25%. It employs the famous M/40 controller movement — free from backlash, lost motion, and friction. This is a rugged, low-cost, compact controller using standard M/40 parts throughout . . . easy to get at . . . easy to service.

For control of simple processes—temperature, pressure, liquid level, or humidity — it will pay you to investigate the convenience and the precise, reliable performance of the Foxboro M/41A Indicating Controller. Write for Bulletin 5A-13.

New Design Features

- Longer Scale — 5" effective length.
- Snappy "On-Off" Control Action on measurement change of only $\frac{1}{4}$ of 1% of 1% scale.
- Alternate Proportional Action adjustable from $\frac{1}{4}$ of 1% to 25%.
- "Permaligned" Precision Controller Movement — Exclusive Self-Aligning Ball-Linkage—Non-Backlash Vernier Index Drive
- Simple Rugged Construction—All Parts Easily Accessible

THE FOXBORO COMPANY, 362 NEPONSET AVE., FOXBORO, MASS., U.S.A.

FOXBORO

REG. U.S. PAT. OFF.

INDICATING CONTROLLERS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND



In Ammonium Sulfate Manufacture Monel is used for mother liquor tanks, scrubbers and in saturators like these being made at the Colonial Iron Works, Cleveland, Ohio. Each of these units is 30 feet high, with a 6 ft. diameter at the bottom, 9 ft. diameter at the top. $\frac{1}{4}$ " Monel plate is used for the shells.

Where to post Monel to guard against Sulfuric Acid Attack!

It takes a "command decision" to safeguard equipment against sulfuric acid corrosion.

You need to know under what conditions the attack will be made . . . and which of the materials at your command will put up the strongest defense.

If conditions are essentially reducing — if the concentration of the acid is below 80-85% at room temperature (or 12 to 15% at boiling temperature), and oxidizing compounds are absent — the chances are that Monel is the most economical alloy you can use.

Specific Examples

Organic Sulfations and Sulfonations: Monel is used in complete reactors, in linings, heating coils, agitators, pipe, fittings, and pumps. In making alkyl aryl sulfonates, Monel is widely used in neutralization, settling and evaporating equipment, to prevent corrosion and protect product purity. Sulfated oils processed in Monel equipment are normally equivalent in color to those processed in glass.

Fat Splitting and Organic Esterifications and Condensations:

Monel is a standard material here to resist corrosion by the sulfuric acid commonly employed as catalyst. Solid or lined splitting tanks, for example, have shown less than .01 inches loss of metal in a year of continuous operation. Even where liquid temperatures go as high as 300° F., Monel heating coils are being used successfully. In condensing phenol-formaldehyde resins, reaction kettles, agitators, vapor lines and the condensers are all made of Monel.

Petroleum Refining: Monel tanks are used for sulfuric acid treatment and subsequent washing of lubes and light industrial oils; Monel cloth to filter clay-treated acid stocks, Monel bowls for sludge separation centrifuges and Monel rods for sludge handling pumps.

Treating Coal Distillates: Monel tanks and agitators are used in treating crude benzol, light oils, naphthalene and similar products with sulfuric acid.

Whenever you deal with dilute sulfuric acid there is an excellent chance that Monel is the best and most economical metal to use to safeguard your equipment.

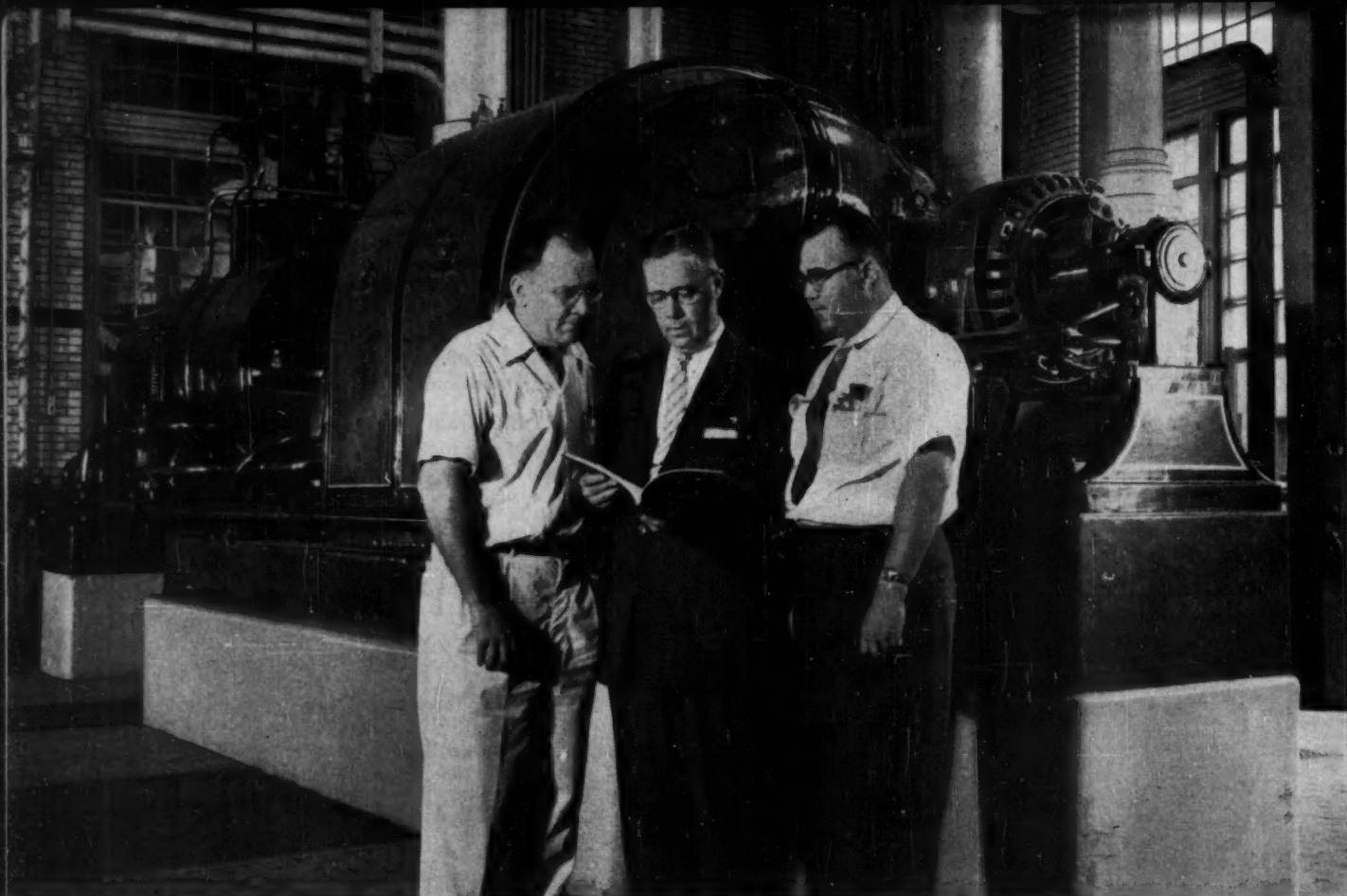
If Monel won't do . . . one of the other Inco Nickel Alloys may prove to be just what you need. For further guidance contact Inco's Development and Research Division . . . and write for our 44-page Technical Bulletin T-3, "Resistance of Monel, Nickel and High Nickel Alloys to Corrosion by Sulfuric Acid."

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

Inco Nickel Alloys

Monel . . . for minimum maintenance





E. A. Hamann (left), Power Generation Engineer and Robert Best (right), Superintendent of Utilities, go over lubrication records with Bill Schall, Standard Oil lubrication specialist. Bill Schall has been providing technical sales service to Standard Oil customers since 1943. Bill is an engineer with a B.S. in engineering from Georgia Tech., and a graduate of Standard's Sales Engineering School. Customers of Bill's find this experience and background pay off for them.

Anheuser-Busch Turbine Lubrication Record

Generator Capacity	Start up and NONPAREIL Installation Date	Date of Last Oil Analysis	Neutralization Number
3,000 kw.	Oct. 2, 1930	July 20, 1954	0.03
3,000 kw.	Oct. 2, 1930	July 22, 1954	0.02
2,500 kw.	June 10, 1940	July 20, 1954	0.03
7,500 kw.	Jan. 2, 1948	July 22, 1954	0.03
7,500 kw.	July 26, 1951	July 22, 1954	0.01

Anheuser-Busch still using same turbine oil after 24 years

For more than 24 years the Anheuser Busch Brewery, St. Louis, Mo., has been operating two 3,000 kw., turbines using NONPAREIL Turbine Oil. Three more turbines added to the system in 1940, '48 and '51 have also used NONPAREIL since beginning operations. The reason for choosing NONPAREIL is clear; it is guaranteed for the life of the turbine.

Since the initial installation, Anheuser Busch has not had to replace a NONPAREIL Turbine Oil fill. Neutralization number is always far below 0.15 mg. KOH/g., the degree of acidity Standard Oil guarantees NONPAREIL

...NONPAREIL

will not exceed. At nearly all times neutralization number is on the order of 0.03 mg. KOH/g. (See chart).

In all these years, oil systems have remained clean. There has been no problem of oil acidity in any of the five turbines. The delicate art of brewing world famous Budweiser goes on without concern over power failure due to lubrication failure.

Like to know more about NONPAREIL and its possible use in your turbines? In the midwest call your nearby Standard Oil lubrication specialist. Or, contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



STANDARD OIL COMPANY
(Indiana)



Insulation is snapped on 8" pipe



Staples are used to close seam

Texas City Chemical Company takes advantage of —

LOWER HEAT LOSSES, LOWER COST with new G-B SNAP*ON Pipe Insulation

**Company saves 32,000 Btu per hour,
with 1/2" less wall thickness**

Problem: Over 1700 feet of pipe that was to carry steam or molten sulfur at temperatures up to 300° F. had to be insulated at Texas City Chemical Company's new dicalcium phosphate and sulfuric acid plants at Texas City, Texas.

Solution: Company's chief engineer approved G-B Snap*On glass fiber insulation, when calculations showed less heat loss at a lower material cost than another widely-used insulation material.

The pipe insulation, composed of fine glass fibers bonded with phenolic resin, was supplied in standard one-piece sections six feet in length. It was spread apart at the seam and snapped-in-place on the pipe. Results: Besides material and heat savings, the insulation contractor (Precision Insulating Co.) reports that the applied costs were 20% less than the job estimate (based on time standards for other insulating materials).

At 300° F. mean temperature, the heat loss comparison was calculated for the job. (See table.) At this temperature, a savings of over 30,000 Btu per hour was found. This improved insulation performance resulted even with 1/2" less wall thickness.

As the insulation did not chip, break, or crumble, no tailings were left around installation area.

G-B Snap*On glass fiber pipe insulation is available in sizes that will fit pipe from 3/4 inch to 33 inches nominal diameter, inclusive.

Write today for samples and full details or call G-B Snap*On distributors (in the Yellow Pages) who carry local stocks in 72 cities.

Heat Loss Comparison
Snap*On vs Competitive Insulation

Nominal pipe size	Length (ft)	Competi- tive in- sulation thickness	Btu/ft loss (300°F)	G-B Snap*On insulation thickness	Btu/ft loss (300°F)	Total Btu savings per hr
8"	444	2	120	1 1/2	91	12,876
6	6	2	97	1 1/2	76	126
4	300	2	73	1 1/2	53	6000
3	582	1 1/2	73	1	59	8148
2	432	1 1/2	55	1	43	5184
	1764					32,304

GUSTIN-BACON

Manufacturing Company **gb**

Thermal and acoustical glass fiber insulations • Pipe Couplings and fittings • Railroad gaskets and supplies

252 W. 10th St., Kansas City, Mo.

Announcing

the new Clarage TYPE XL Industrial Fans

Exceptional Fan Equipment distinguished by:

1. High efficiency characteristic.
2. Rugged, tight construction.
3. Three interchangeable wheels — each with radial blades.
4. Large size range — 11" through 60" inlet diameters.
5. Pressures to 18" SP; volumes to 130,000 CFM.

Inlet adjacent to wheel is shaped to promote efficient, stable performance.

Wheel blades are designed for minimum shock loss.

Heavy steel plate housing features a tight, continuously welded construction at the scroll.

Housing scientifically proportioned to minimize losses and maintain high fan efficiency.

Adjustable to any of eight standard discharges by merely removing top bolts on each side and rotating the housing between the sideplates.

Type XL fans shown here are typical of the smaller sizes which provide universal discharge. Larger sizes are of reinforced sheet steel and base angle construction extending to the foundation line.

Send for Bulletin 702

A new, modern design offering many distinct advantages!

Clarage Type XL industrial fans are particularly well suited for diversified air and material handling applications. You'll profit from the high efficiency, in-the-field adaptability, and numerous other features of this exceptional fan equipment.

Learn more about these distinguishing features by requesting Bulletin 702, or contacting the nearest Clarage application engineering office.

CLARAGE FAN CO., Kalamazoo, Mich.

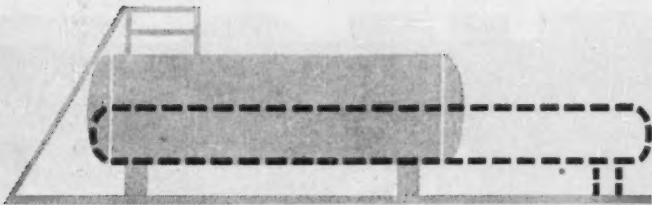
You can Rely on...

CLARAGE



Headquarters for
Air Handling and
Conditioning Equipment

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal



New 30,000 GALLON "SPACE-SAVER" *takes 30% less space*

ONLY QCF OFFERS ALL THESE FEATURES

Complete Stress Relieving eliminates stresses set up during forming and welding ... provides resistance to fatigue caused by temperature changes or pulsating loads.

Complete Radiography of every welded seam assures freedom from slag inclusions, porosity and undercutting.

Hartford Steam Boiler Inspection in accordance with ASME 1952 Code W-XR-SR.

Steel Grit-Blasting of tank exteriors to remove mill scale, resulting in a smooth surface for red lead primer.

Manway for thorough internal inspections and cleanings.

Steel Saddles and Supports for installation on flat foundations are optional.

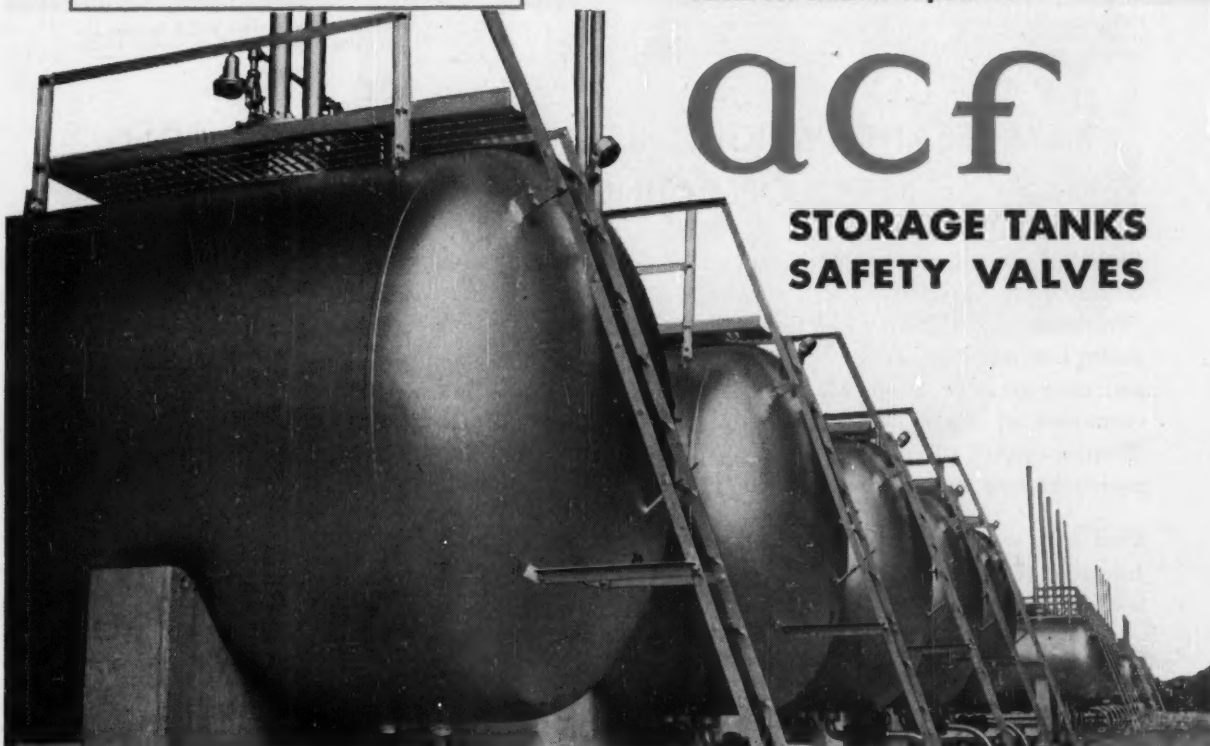
Newly designed QCF Storage Tanks feature a 50-foot length ... as compared against the usual 71-foot length of 30,000 gallon capacity tanks. These new larger diameter tanks require far less installation space ... permit shipment on a single car ... allow cross-loading on export barges. They weigh only 67,000 pounds, resulting in more economical shipping, rigging, handling, and installation.

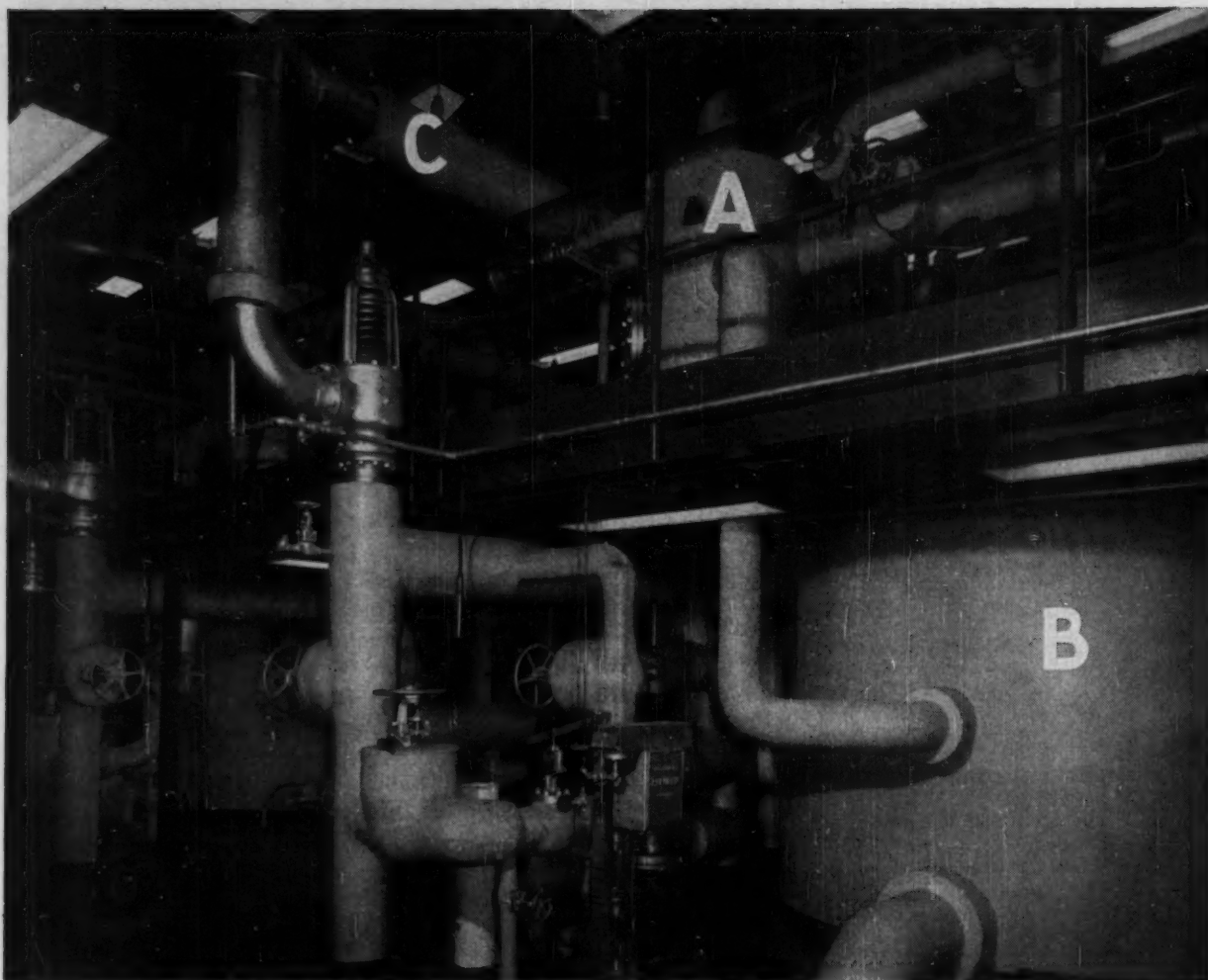
QCF Tanks are available for L-P gas, anhydrous ammonia, and other gases or liquids under pressure. For more specific details, write or call: Dept. 2-C, QCF Industries, Incorporated, Industrial Products Division, 30 Church Street, New York 7, New York.

**Proportionately Shorter
Tanks for Smaller Capacities**

acf

STORAGE TANKS SAFETY VALVES





Piping and equipment in the Sunbury Steam Electric Station of the Pennsylvania Power & Light Company, insulated with "Featherweight" 85% Magnesia Insulation. The flash tank, "A", and the deaerator, "B", which operate

between 250 and 275°F, are insulated with 2 inches of 85% Magnesia and ½ inch of asbestos cement. The piping, indicated at "C", is insulated for the protection of personnel.

K&M "FEATHERWEIGHT" 85% MAGNESIA INSULATION KEEPS OPERATING COSTS DOWN

Plants of almost every type throughout the country have benefited from the use of K&M "Featherweight" 85% Magnesia Insulation. By reducing heat losses, operating efficiency is improved and costs are kept down. Made of 85% basic carbonate of magnesia and asbestos fiber, "Featherweight" effectively insulates piping and equipment with temperatures up to 600°F.

Used with a primary layer of K&M Hy-Temp Insulation (Diatomaceous Silica), the combination is effective up to 1900°F. The application of these

two layers—with staggered joints—eliminates the heat loss that normally occurs when expansion causes the joints to open in single layer installations.

Also available is "Featherweight" Water-Resistant Magnesia Insulation for temperatures up to 450°F. It is used underground where severe water exposure may damage the insulation or on indoor steam heated lines and equipment where high humidity and moisture are present.

If your company has an insulating problem, contact your K&M distributor who is an experienced applicator. Or write directly to us.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

Nature made asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

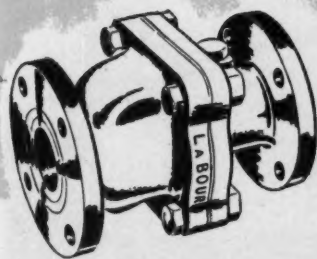


LABOUR

introduces a new line of valves for handling chemicals

The ruggedness, quality, and low maintenance costs for which LaBour pumps have long been famous in the chemical industry are now available in a family of globe and check valves. Like LaBour pumps, these new valves have been designed specifically for the chemical industry—they are not merely corrosion resistant.

Available in a variety of alloys to meet requirements and in sizes from 1" and up, LaBour valves incorporate features which extend their service life and make maintenance easy. Send for bulletins H-1 and H-2.



Check valves as well as globe valves are included in this newly created series. Check valves may be mounted either horizontally or vertically without internal change.



ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR VALVES

THE LABOUR COMPANY, INC. • ELKHART, INDIANA, U.S.A.



**For SODA ASH . . .
WEST END
serves the West best**

West End serves the West quickly, efficiently and economically with highest quality soda ash. For 30 years, West End has been constantly enlarging its manufacturing and storage facilities so that the normal and emergency needs of western industry will be met promptly regardless of market conditions. Strategic location of plant permits fast, economical transport by rail or truck to any point in the West.



*Write for samples,
prices and technical data.*



IMMEDIATE SHIPMENT to customers throughout the West in company's own leased hopper cars . . . ready at all times.



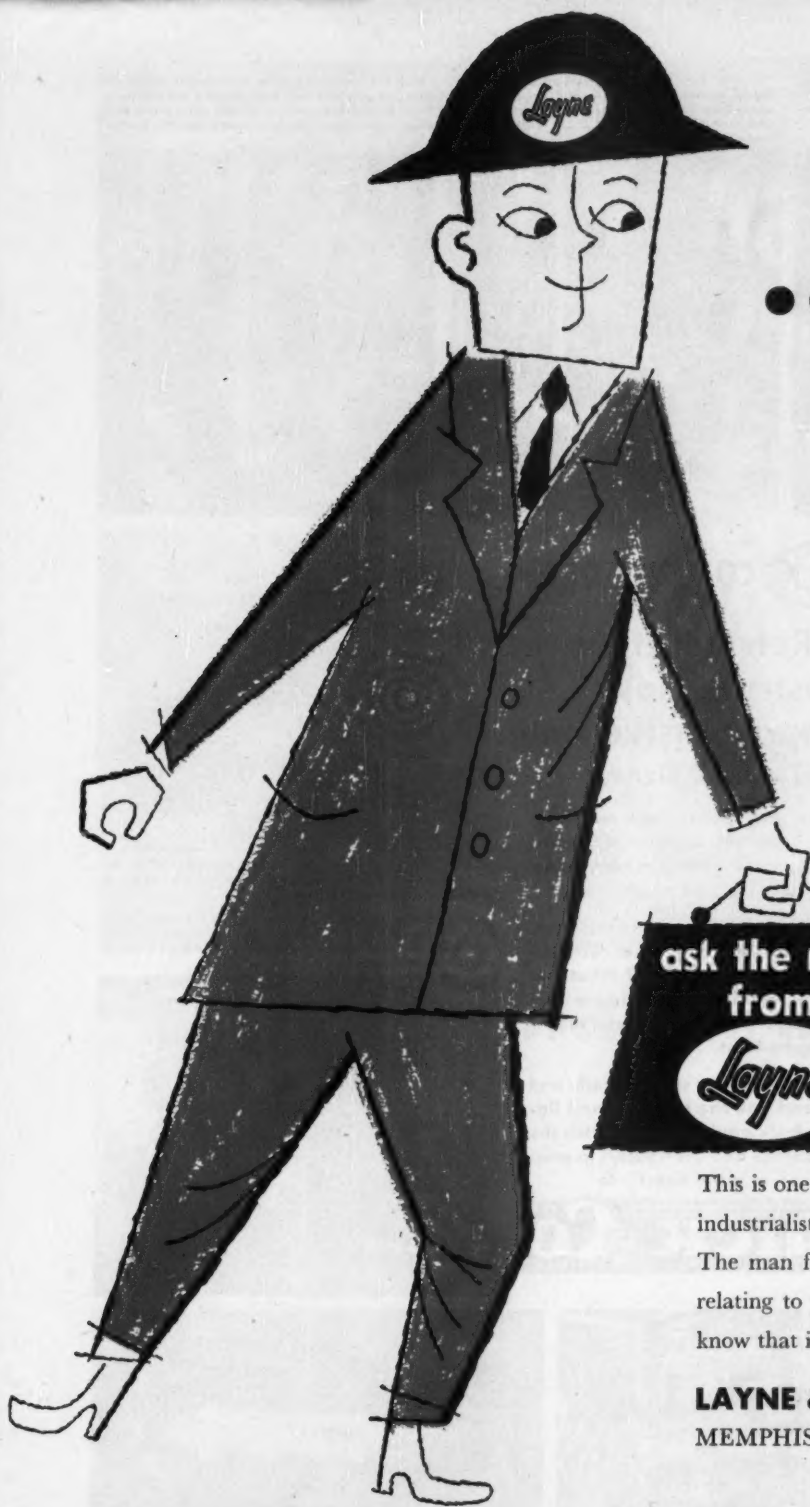
◆ **PERSONAL SERVICE** — Customers anywhere in the West are only a few hours away by company plane.



◆ **30 MINUTE IN - AND - OUT LOADING** for bulk trucks at any hour of day or night through "serve yourself" delivery.

West End Chemical Co.

Executive offices: 608 Latham Square Building, Oakland 12, California • Plant: Westend, California



...needed:

factual information
on water potential
to locate
new factory site!

—Many facts must be gathered, screened and verified before a decision that may involve millions of dollars in capital expense is made. And not the least important is the water potential.

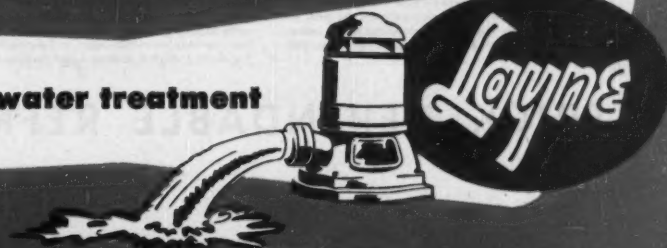
This is one of the many services that leading industrialists have called upon Layne to perform. The man from Layne is eager to answer any questions relating to water. And agriculture, industry and municipality know that it is wise first to "ask the man from Layne."

LAYNE & BOWLER, INC.

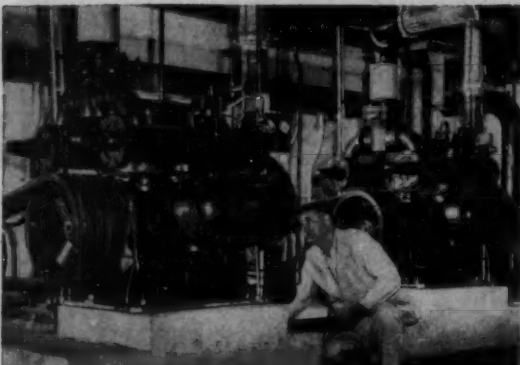
MEMPHIS 8, TENNESSEE

**Layne Associate Companies
throughout the World**

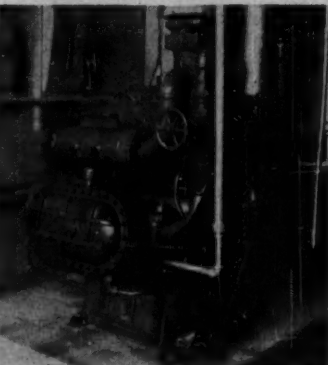
water wells • vertical turbine pumps • water treatment



Frick "ECLIPSE" Type PF compressors, built in six sizes up to 150 H.P. and having 2, 3, 4, 6 or 9 cylinders, may be used with any refrigerant at any temperature. They are ideal for such work as air conditioning, marine service, watercooling, food storage and processing.



"ECLIPSE" Type AHP compressors are available for regular ammonia service under high operating pressures. These heavy-duty machines are built in three sizes with 3, 6, or 9 cylinders of 3 1/4" bore and 4 1/4" stroke.



"ECLIPSE" Type PAB booster compressors, built in six sizes, are noted for their dependability and efficiency. Small frosted lines cool the cylinder valve plates with direct-expansion refrigerant—a patented Frick feature.



COMPRESSORS •

the Refrigeration Industry's Most Comprehensive Line

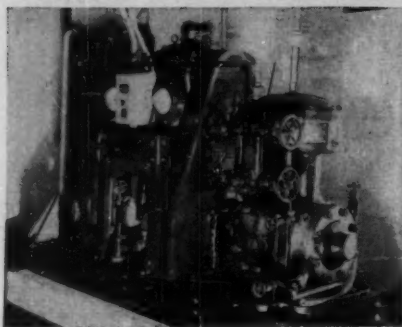
• 83 Types & Sizes

When you specify Frick machines you have the widest choice of models, and are sure of getting a compressor exactly suited to your needs.

Are you handling one of the Freons, or ammonia, or some other refrigerant? At what temperature? Whatever your load, there's a Frick machine built to meet every commercial and industrial requirement.

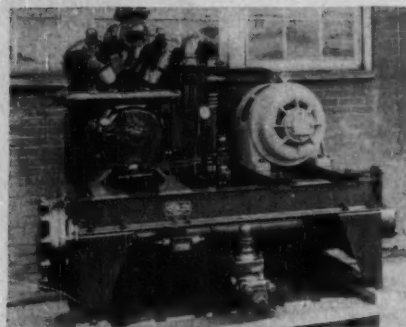
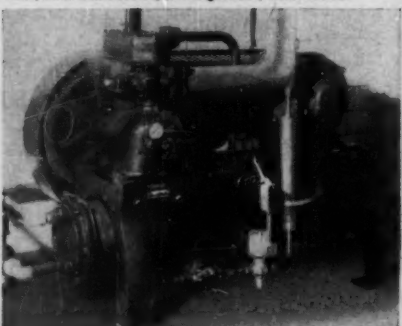
Tell us about your cooling work, and we'll send you the full facts and figures on Frick equipment to match the job. Branches and Distributors in principal cities, or write directly to

FRICK CO.
DEPENDABLE REFRIGERATION SINCE 1882
WAYNESBORO, PENNA. U.S.A.



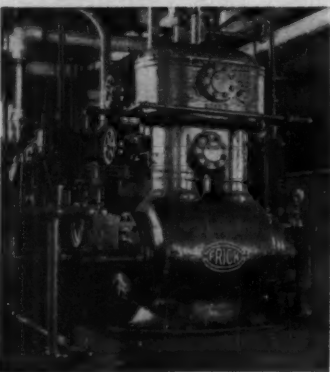
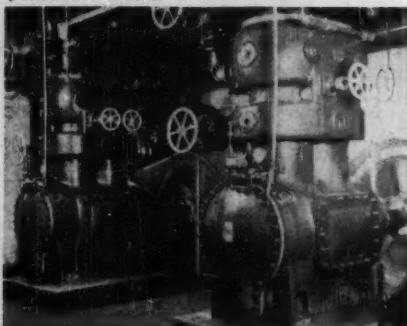
Combined ammonia units are manufactured in three sizes ranging from 2 1/2 to 10 tons of refrigeration. They are a popular choice for food service, cooling drinking water, making ice, dairy plants, etc.

Frick low pressure units are built in 36 sizes from 1/4 to 15 hp. Condensers on smallest machines are air cooled; on intermediate sizes, air or water cooled; and larger sizes, water cooled.

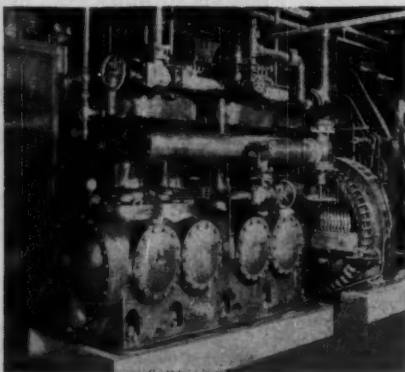


"ECLIPSE" Type PF low pressure units are furnished in 15, 20, 30, 40 and 60-hp. sizes. Shell-and-tube coolers may be added to form compact water chilling units.

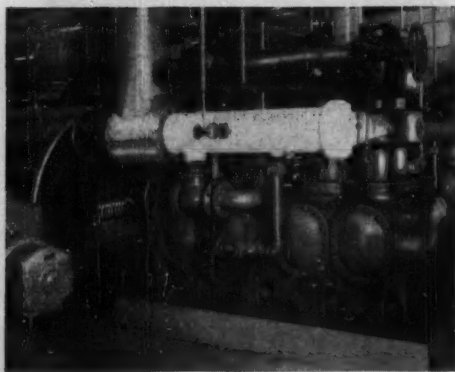
Frick Company pioneered the development of the booster compressor. Since 1929 these Type PB machines, built in seven sizes, have been regularly installed by ice cream and quick freezing plants all over the world.



Frick two-cylinder enclosed Type V.S.A. ammonia compressors have been perfected over the past 40 years, until today they are the standard of the industry. They are available in capacities from 2 to 300 tons, in 11 sizes.

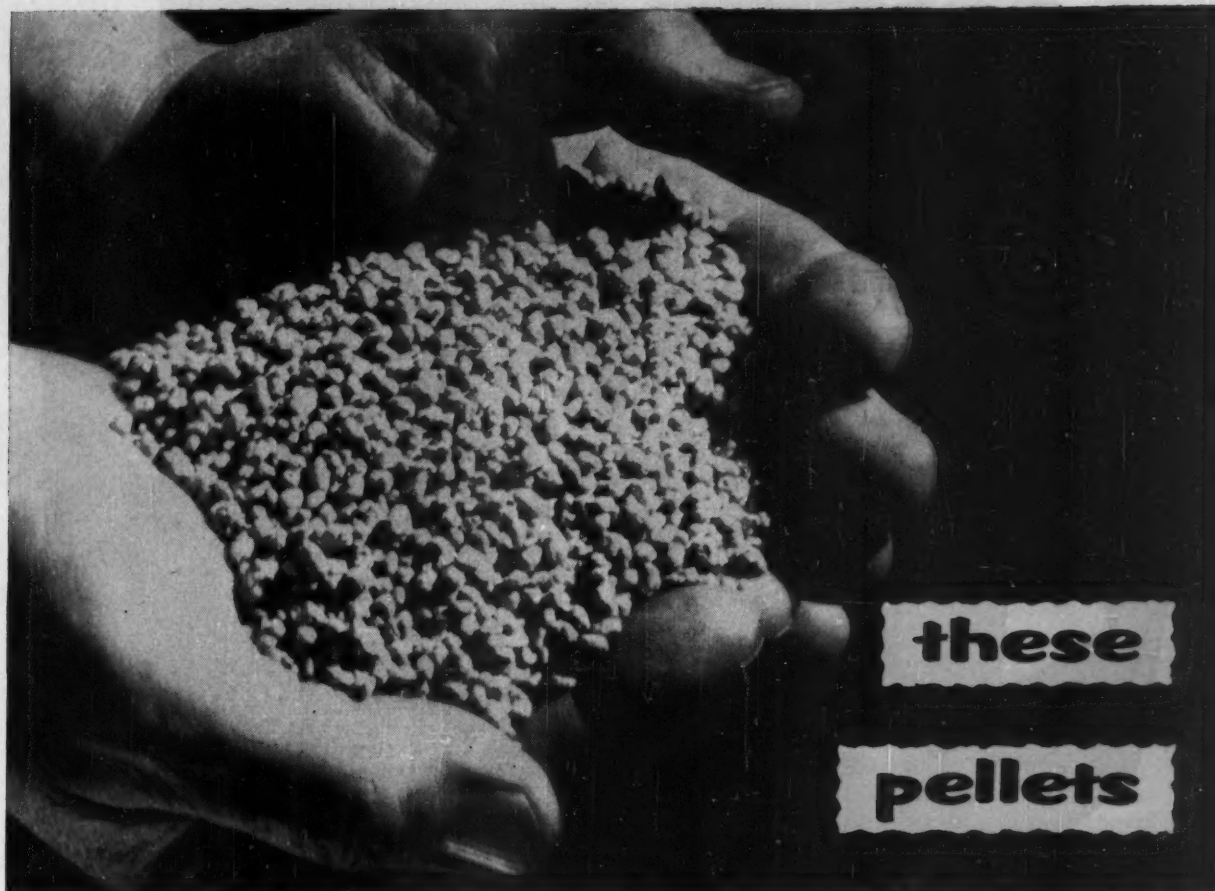


Four-cylinder Type V.S.A. enclosed compressors are normally offered in four sizes with capacities up to 800 tons. Furnished with capacity controls on each cylinder, these machines give the user maximum flexibility and durability on heavy-duty refrigerating service, such as in the food and chemical industries.



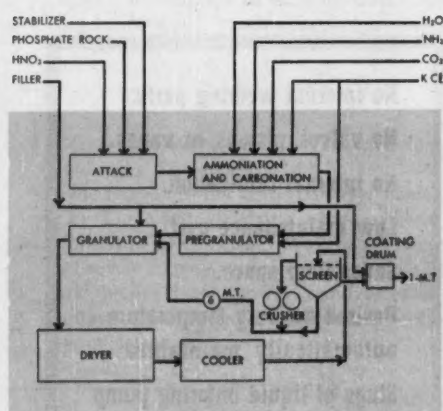
Frick four-cylinder Type PB enclosed V.S.A. ammonia booster and Freon-12 compressors are available in 15" by 10" and 17 1/4" by 12" sizes. Seabrook Farms, the world's largest quick-freezing plant, has eight of the larger size.

FRICK DEPENDABLE REFRIGERATION SINCE 1882



**these
pellets**

could make you rich



PEC Patented Carbonitric Process

More than likely you're looking at complex fertilizer pellets for the first time. *Each* pellet contains balanced quantities of nitrogen, phosphorous and potash, although the units of plant food can be altered to suit the needs of any particular soil.

C&I has the exclusive right to license the PEC* continuous chemical, carbonitric process which produces this superior pelleted fertilizer. C&I will provide a complete and integrated plant or any of the individual units (ammonia, nitric acid, complex fertilizer) for the production of complex fertilizer in any desired capacity. Plants are erected at a fixed price with productions and efficiencies fully guaranteed.

There are still several choice plant-sites available where competition would not exist. Since new economic frontiers do not remain undeveloped for long, now is the time to consider complex fertilizer as an investment in the nation's fastest growing industry.

Specialists in



Processing Ammonia

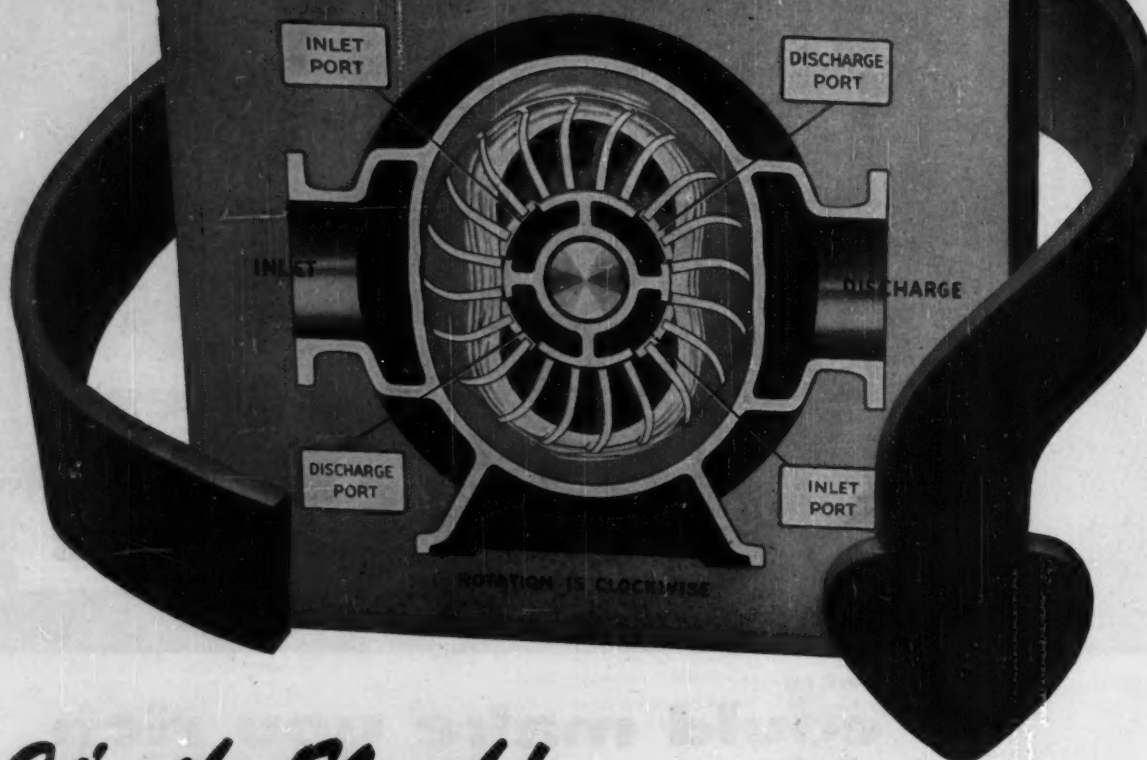
* Potasse et Engrais Chimiques



THE CHEMICAL AND INDUSTRIAL CORP.

CINCINNATI 26, OHIO

This is Why the Nash is the Most Simple Compressor



It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

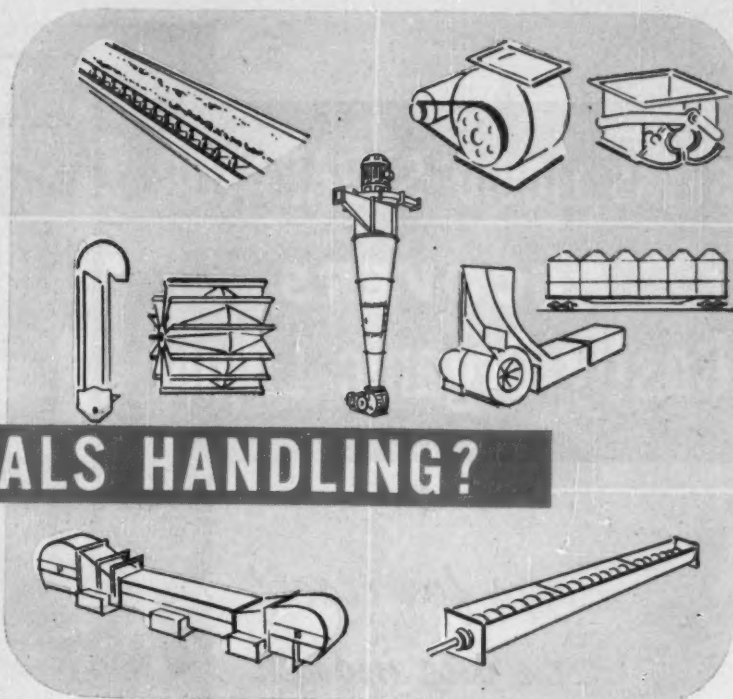
Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY
313 WILSON, SO. NORWALK, CONN.

which method
can save you
the most in

BULK MATERIALS HANDLING?



AIR

Outstanding examples of the great savings made possible by pneumatic conveying systems are found in the Sprout-Waldron Pneu-Vac. This modern, negative-pressure system handles granular, pulverized, and flaky materials without passing them through the fan. Mechanical friction and exterior dusting are eliminated. The unit is self-cleaning. It cools, heats, aerates, or dries. There are few moving parts. As a result, Pneu-Vac pays in many ways—

99.96% material recovery...no handling losses...increased production...greater safety...low maintenance...no product intercontamination...no fan wear...elimination of exterior dust...improved working conditions...small space requirements.

zontally and up inclines. Sprout-Waldron offers sound guidance on belt conveying applications and a full line of pulleys...and is the exclusive manufacturer of the famous Belt-Saver Pulley that lengthens belt life up to 400%.

BUCKET

Bucket elevators use less power, are usually lowest in first cost and maintenance expense. However, they cannot be made as self-cleaning and contamination-proof as other materials handling systems. Sprout-Waldron offers bucket elevators in bucket sizes from 3" x 3" to 30" x 16"...wood, stainless, carbon steel, and aluminum...chain or belt, high speed or conventional.

SCREW

Screw conveyors offer advantages for two types of jobs: (1) The straight-line horizontal conveying of a wide range of bulk materials over moderate distances. (2) The vertical lifting of non-fusing materials to limited heights. Sprout-Waldron vertical and horizontal screw conveyors are extremely low in maintenance and moderate in power requirements. Available in conventional helicoid, continuous sectional, and sectional types.

FEEDERS

To provide the greatest possible savings in applications calling for rotary vane feeders, Sprout-Waldron offers you three advantages: (1) The most extensive line to be found anywhere. (2) Years of experience gained through pioneering in this specialized field. (3) The simplest, sturdiest and easiest-to-maintain feeders available.

Whichever type of conveying equipment fits your needs, you'll get greatest savings with a Sprout-Waldron installation. Sprout-Waldron solves your problems with a vast background of experience, complete lines of equipment and unique "adaptioneering" methods. Let us advise you without cost or obligation. Please write for details.

BELT

Belt conveyors are unequalled in speed and economy for long-distance conveying of bulk materials hori-

YOUR INVESTMENT PROTECTED

Our 88 years of service to industry is good assurance that you can obtain parts and service for the life of your Sprout-Waldron equipment.



SPROUT-WALDRON

Manufacturing Engineers Since 1866

Equipment for SIZE REDUCTION • MIXING & BLENDING • PELLETING & CUBING • BULK MATERIALS HANDLING • PRODUCT CLASSIFICATION

Facilities for fabricating, machining, custom founding, woodworking, laboratory testing

15 LOGAN STREET • MUNCY, PA.

336

SELAS LIQUID SEPARATOR **RECOVERS** Costly Organic Liquid

*Pays for itself
in one month
of operation*



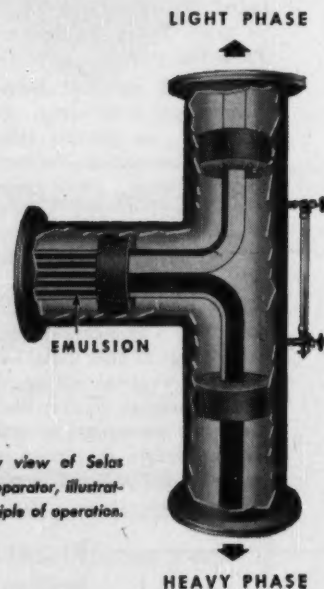
AN eastern chemical manufacturer was forced to discard an emulsion containing an expensive organic liquid because it resisted breakdown and separation. Then a Selas Production Liquid Separator was installed. It solved the phase separation problem and liquidated its own cost in 30 days of operation.

Handling 600 gph on a continuous basis the Separator first coalesces the emulsion, then separates the resulting phases. The organic liquid phase is discharged to a recovery tank and the clear-water phase is drained away.

You can use Selas Liquid Separators in steam distillations, solvent extractions, and organic reactions in chemical and pharmaceutical processing. The Separators enable you to reclaim costly materials and to dewater solvents for re-use at very low cost. They provide simple, continuous breakdown and recovery even under corrosive conditions. Capacities of single units range from 10 to 6000 gph.

Our test laboratory will process your emulsion sample and submit complete specifications without obligation.

Write today for Bulletin SC-1044, "Selas Liquid Separator" and Bulletin S-1010, "Fluid Processing."



Cutaway view of Selas Liquid Separator, illustrating principle of operation.

SELAS

FLUID PROCESSING

CORPORATION OF AMERICA • PHILADELPHIA 34, PA.



MISSION

Centrifugal

SOLID PLASTIC PUMP

The fluid end of this pump is solid plastic, not simply lined or coated. The chemical resistance exists throughout instead of being confined to a thin surface layer. The plastic is a composition known by the trade name of HAVEG which is exceptionally resistant to most acids, bases, and salts, to chlorine, and to many solvents and other chemicals excepting those of a highly oxidizing nature. It can be used continuously at temperature ranges to 265° F.

Capacities to 325
gpm, Heads to 158
feet. 2-inch dis-
charge, 3-inch suc-
tion, one size only.

MISSION

MANUFACTURING CO.

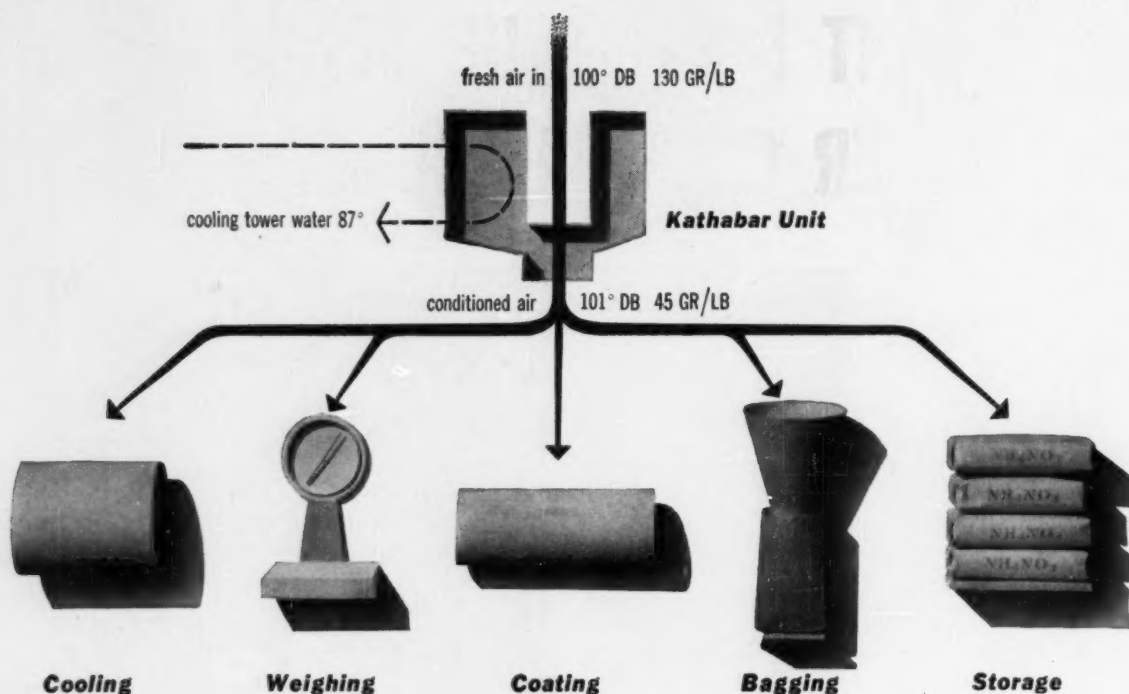
HOUSTON, TEXAS

Humble Road, P. O. Box 4209, Phone OX 4-5561

Export Office: 30 Rockefeller Plaza, New York

Handled by representatives in all industrial areas
and by supply stores in every oil country.





HOW KATHABAR HUMIDITY CONDITIONING STOPS MOISTURE REGAIN IN AMMONIUM NITRATE

using 87°F coolant to get 46°F dewpoint

You can prevent moisture regain in the production of hygroscopic materials—common problem in chemical industries—by taking a cue from major producers of ammonium nitrate. They use Kathabar humidity conditioning to bathe process areas with a protective atmosphere of dry air in equilibrium with their dried prills.

Before they applied Kathabar equipment to this problem, costly recycling was often necessary to restore proper dryness and avoid clogged conveyors and bagging machines, bricking up in storage, inaccurate bagging.

Ammonium nitrate producers selected Kathabar systems to solve these problems because of several operational advantages. Kathabar units are *economical*; can deliver air at 46°F dewpoint with 87°F cooling tower water. No expensive over-cooling and reheating. They're *rugged*; perform effectively with only routine maintenance in the extremely corrosive ammonium nitrate atmospheres. They're *safe*; absorbent solution is non-inflammable, will not carry over.

Kathabar units are doing similar jobs in many other chemical process industries such as pharmaceuticals, plastics, food, rubber, film, atomic energy. They can meet your exacting requirements, too—economically, effectively, safely. Call your Kathabar system engineer or write for Literature Group K54-3 to learn how this equipment can earn for you.

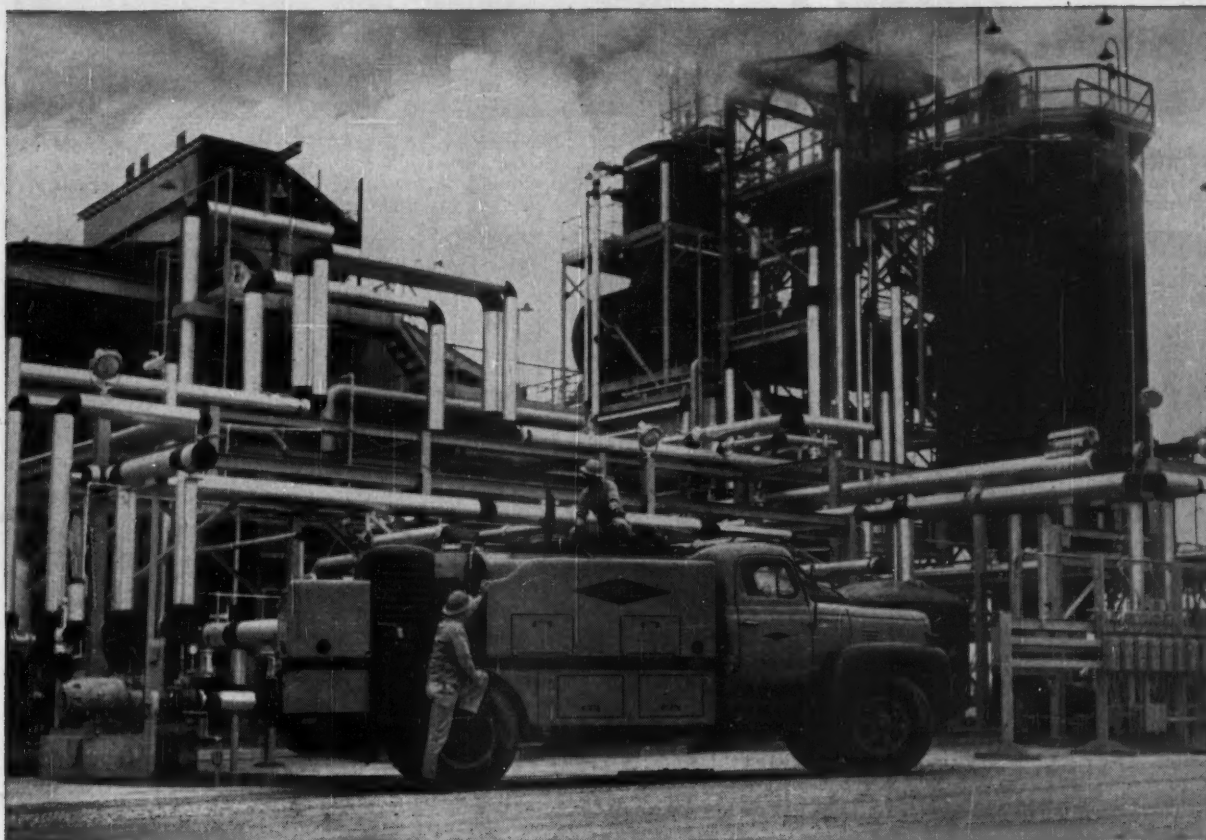


SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF **Surface** INDUSTRIAL FURNACES

Janitrol AUTOMATIC SPACE HEATING

PLANT PROFITS UP \$77,000 AFTER CHEMICAL CLEANING



**DOWELL method
of cleaning lines
and process equipment
cut plant turn-around
time 22 days**

Dowell was called to remove scale from pipe lines and process equipment in a plant where the semi-annual turn-around usually meant long, costly downtime. Dowell engineers used liquid solvents to do the job. It was not necessary to dismantle the equipment as the chemicals were introduced through regular connections. The job was done in far less time than ever before.

In fact, outage time for the year was reduced 22 days, representing an estimated \$77,000 additional profit to the plant. As a result, Dowell Service

was made a regular part of the plant's turn-around maintenance program.

The Dowell method of preventive maintenance cleaning with chemicals has helped to avoid the replacement of many miles of water and process lines and thousands of dollars worth of plant equipment. Chemical cleaning often uncovers weak points and helps to avoid later failures.

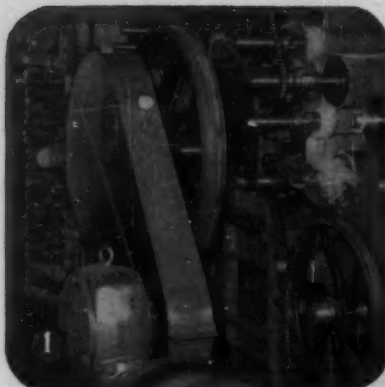
For complete details, call the nearest Dowell office. Or write DOWELL INCORPORATED, Tulsa 1, Okla., Dept. B-33.

DOWELL SERVICE

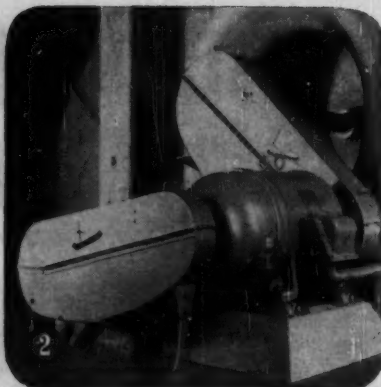
chemical cleaning service for industry



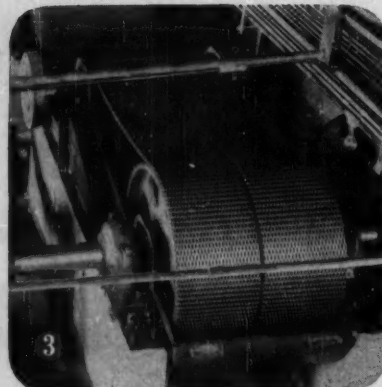
A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY



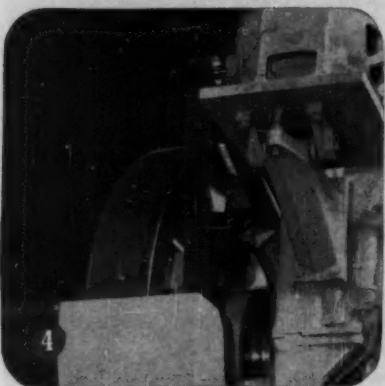
1 ADVERSE OPERATING CONDITIONS. Humidity, heat, cold do not lower Link-Belt Silent Chain's better-than-98% efficiency.



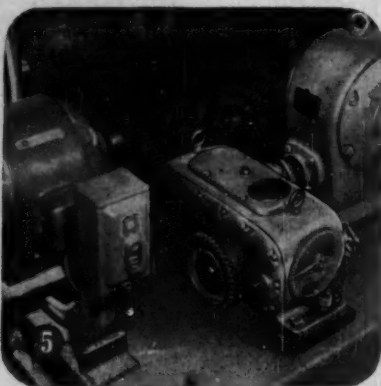
2 UNFAILING SAFETY. Dependability assures continued production. On above tunnel ventilators, Link-Belt drives protect human life.



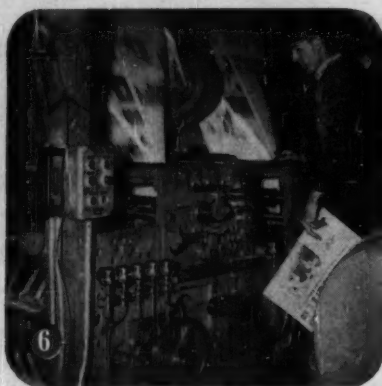
3 LARGE OR SMALL HP. A versatile line, Link-Belt Silent Chain drives are available from fractional to thousands of horsepower.



4 LARGE RATIOS. Link-Belt Silent Chain operates efficiently on extremely short centers at ratios as high as 10-to-1.



5 LIMITED SPACE. Easy to assemble in close quarters, Link-Belt Silent Chain permits built-in drives, compact housings.



6 HIGH SPEED. After 13 years on this newspaper press at speeds up to 4700 fpm, Silent Chain is still efficient.

Big reasons why *LINK-BELT Silent Chain* is specified for so many drives:

WHEN using a Link-Belt Silent Chain Drive, you can look forward to better-than-98% efficiency throughout its long operating life. What's more, silent chain offers the sureness of positive tooth-to-tooth action plus the flexibility of a belt. As for economy, silent chain is often lower in cost than other drives far less efficient.

Find out for yourself why so many of today's demanding drives incorporate Link-Belt Silent Chain. Ask your nearest Link-Belt office or distributor for Book 2425, containing complete information.



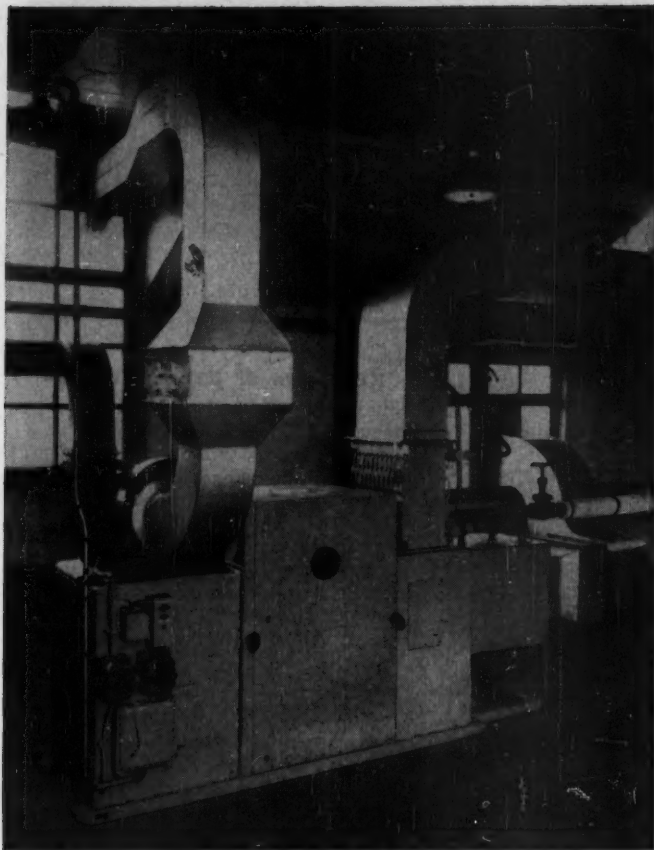
SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

18,719

Here's why *LINK-BELT Silent Chain* offers you more drive per dollar

- Lower cost—often lower in first cost, always lower in ultimate cost.
- Longer life—trouble-free performance for 20 to 30 years is common.
- No dismantling machine or removing sheaves for repairs.
- Better than 98% efficiency.
- Maintained ratio assures full productive capacity.
- Slipless action assures a better product.
- Easy to install.
- Safe to employees—operates in oil-retaining casing.



This British-made Lectrodryer* delivers DRY air to the room where toffee is wrapped.



**"We had to
boil our boots"**

says a British candy maker

**"Now we pick up
the toffee chips with
a vacuum cleaner"**

In the normally moist atmosphere of this candy factory, toffee chips which fell to the floor soon got so sticky that they piled up on the workers' shoe soles. We have the owner's word for it that they actually had to boil their boots to get rid of the gummy mess.

Imagine what this moisture and its resulting stickiness did to packaging machine efficiency!

An atmosphere in which toffee chips stay dry as dust permits uniform production the year around. This is a lesson which men who handle sugar and other hygroscopic materials learned long ago. They stay in production, regardless of outdoor humidities, and processes proceed at top speed.

The booklet, "*Because Moisture Isn't Pink*", tells how others are using DRYing to advantage. For a free copy, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liège.

**LECTRODRYERS DRY
WITH ACTIVATED ALUMINAS**

LECTRODRYER

* REGISTERED TRADEMARK U.S. PAT. OFF.



DARCO

Digest

DARCO DEPARTMENT • ATLAS POWDER COMPANY
Darco General Sales Offices—60 EAST 42nd STREET, NEW YORK 17, N. Y.
ATLAS POWDER COMPANY, CANADA, LTD., BRANTFORD, CANADA

Activated carbon is an efficient reducing agent

Primarily used as a means of removing impurities by physical adsorption, activated carbon also can act as a reducing agent. It has a large surface area at which the reduction reaction can take place. Several specific types of applications have utilized this characteristic of carbon advantageously.

Carbon for dechlorination

This dual use of activated carbon proves valuable in the reduction of traces of halogens in solution. Carbon reacts with chlorine to form the HCl and CO₂. Excess chlorine introduced into water supplies, for example, can be readily removed by passing the water through a granular carbon filter. Filters of this

type have shown an effective life measured in years in treating water containing free chlorine in parts-per-million concentration.

It should be noted that the grade of carbon selected for this application is designed for adsorption from liquids, rather than being a gas-adsorbent type. Its pore openings are large enough to admit large molecules . . . thus it can adsorb organic impurities at the same time that it performs the reduction. The carbon does not adsorb the chlorine gas, nor the chlorine odor. It changes the free chlorine to HCl by chemical reaction. This action is basically different from the usual function of carbon in adsorbing large molecules (such as fatty acids) which cause odor.

Reduction of permanganates

Similarly, residual quantities of permanganates added for oxidation in a solution can be removed by carbon. Potassium permanganate, for example, is reduced by carbon to the tetravalent form; the carbon is oxidized to carbonate. The characteristic deep color of the permanganate disappears . . . but *not* through any decolorizing action of the carbon. The removal of color is due to the chemical reduction reaction that takes place.

Selection of grade of carbon

Any carbon, of course, will provide the basis for a reducing reaction. Only an activated carbon, however, can serve a dual function . . . acting *chemically* to effect reduction, and *physically* to adsorb other impurities of a colloidal, surface active or complex molecular nature that may be present. The use of Darco activated carbon in appropriate grades may prove valuable in applications that you are now facing. Write to us giving complete details, and we'll be glad to make specific recommendations.



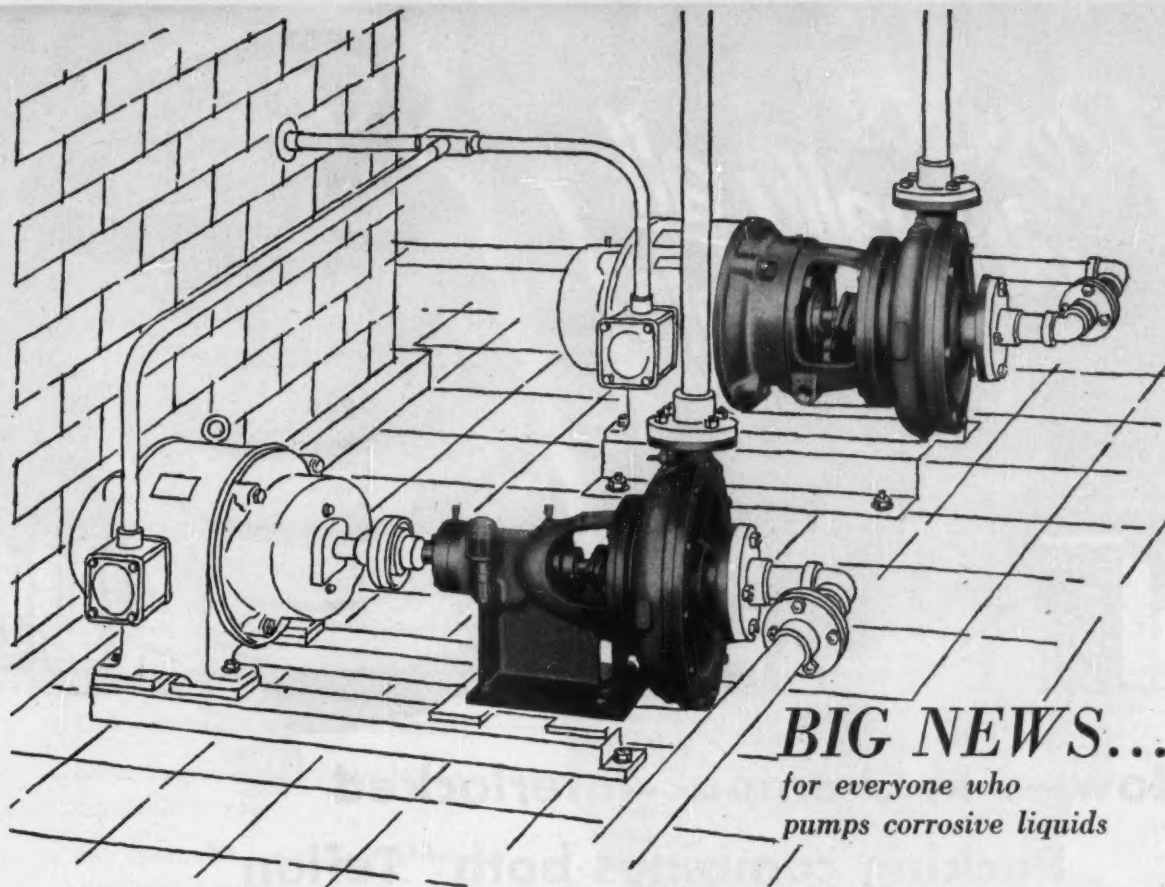
This experiment demonstrates the reducing action of activated carbon. Drop a few crystals of potassium permanganate into a beaker of water, and stir until the solution is well colored. Then add a few cc. of granular Darco. Agitate, and the color will disappear as the carbon reduces the permanganate.

Uniformity of Darco Assured by Daily Tests

To safeguard the quality of Darco activated carbon, samples are taken from production and subjected to laboratory tests. Each day's production must meet rigid standards.

Adsorptive capacity, the most important characteristic of a carbon, is measured against a standard solution. Production samples of Darco must measure within 5% of required relative efficiency.

Filterability, purity and pH of water extract are also checked. Special grades of Darco receive additional tests required for their particular application. Through constant vigilance, in the various stages of manufacturing and in laboratory checking, the uniformity of Darco is held at a consistently high level . . . to assure you that every shipment of Darco you receive, whether by the carton or the carload, will always perform the way you expect in your own process.



*Now you can get the "custom-built" features you want
at no penalty with the
new **AMPCO* Centrifugal Pump***

In a given pump size, new standard units give at least 108 different combinations, plus maximum resistance to corrosion, erosion, cavitation Here's low-cost corrosive liquid transfer at its new, versatile best. If you require pumps in flows up to 600 gpm, this new 1750 rpm pump is exactly right for you. It can be built to *your* special requirements by interchanging standard parts.

You can select the bearings you want — sealed, replenishable-grease, or oil-lubricated.

You can choose your shaft seals — inside or outside mechanical seals; internal, external, or flushing packed stuffing-boxes.

You can get the exact shaft you need — no compromising. Take your choice of general-purpose and extra-rigid shafts as well as a new two-piece unit that allows removal of the rotating parts without disturbing coupling, bearings, or alignment.

You can select the pedestal height and type impeller you want.

Best of all, you don't have to buy another pump when conditions change. You can make modifications quickly

• and inexpensively in the field — save yourself valuable time and money.

Corrosion damage? Forget it. These pumps are built entirely from Ampco or other workable alloys to combat the effects of corrosive acids, alkalis, organic chemicals, etc. And these pumps have many new design features — features that contribute to dependable, maintenance-free pumping.

The new Ampco 1750 rpm Pumps are now stocked for immediate delivery. Contact your Ampco Pump Distributor or Field Engineer or mail the coupon.



Ampco Metal, Inc.

Dept. CE-2, MILWAUKEE 46, WISCONSIN
West Coast Plant • Burbank, California

Fill out this coupon and mail today

AMPCO METAL INC., Dept. CE-2, Milwaukee 46, Wisconsin

The new Ampco Pump sounds good to me. Send me additional information. I pump.....

Name.....Title.....

Company.....

Company Address.....

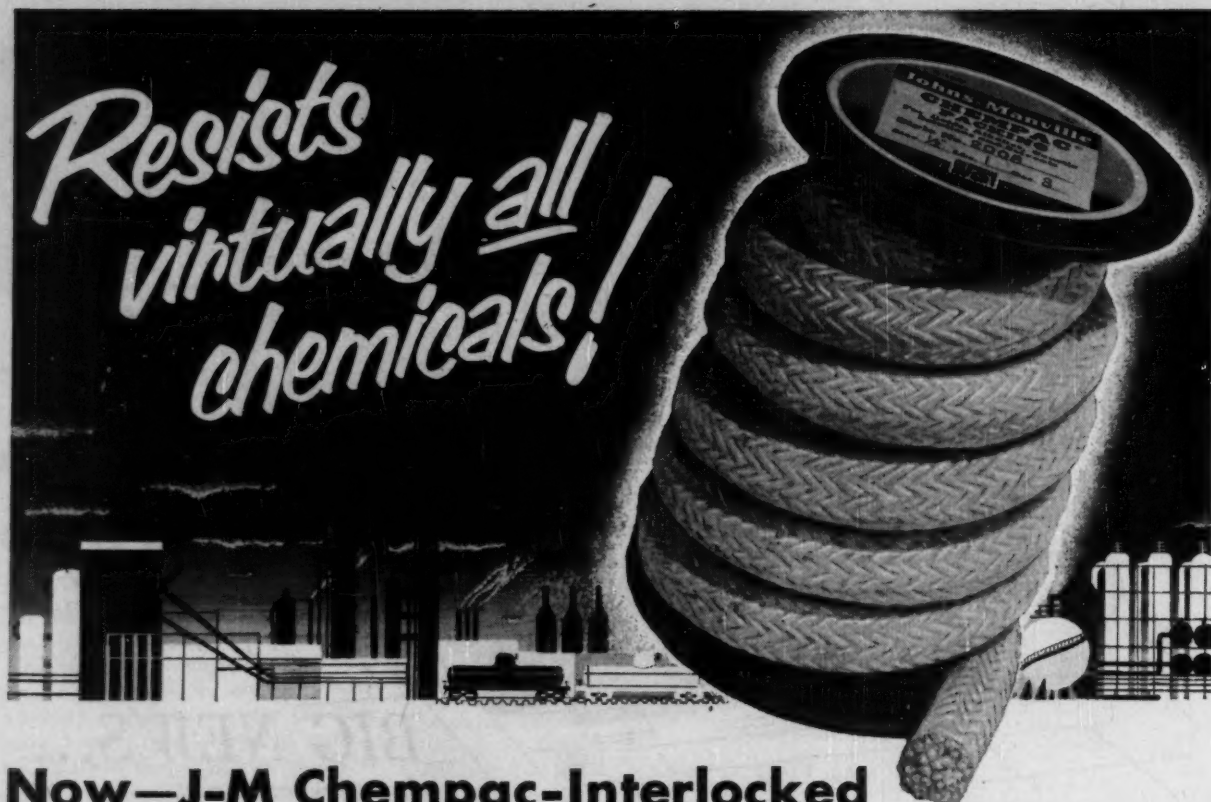
City.....(.....) State.....

*Reg. U. S. Pat. Off.

Maximum Interchangeability without Penalty

P-19

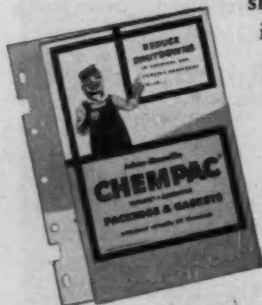
*Resists
virtually all
chemicals!*



Now—J-M Chempac-Interlocked Packing combines both "Teflon" and asbestos protection

Johns-Manville now introduces Chempac®-Interlocked Packing, with three important advantages for service in chemical and process equipment. Interlocked provides the excellent sealing and heat resistant qualities of asbestos. It is braided by the unique and exclusive J-M method, so that the asbestos yarns are securely interlocked and cannot come apart in service. And it is treated with chemically inert Teflon*, which is almost universally resistant to chemical and solvent action.

Chempac-Interlocked can be used to pack pump rods or shafts, rotary filters, mixers and similar apparatus handling strong acids, alkalis, caustic solutions and many other reagents at temperatures to 500F.



Other J-M Chempac Packings and Gaskets for the Chemical and process industries

J-M Chempac Packings in coil, spiral and ring form. Made of asbestos, treated with Teflon, they are available in types for caustic, acid, chlorine and solvent service.

J-M Chempac Gaskets with Asbestos-Teflon base. They have high mechanical strength and heat resistance, with excellent sealability at low bolt stresses.

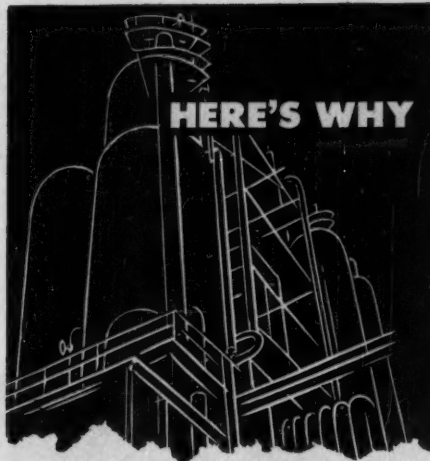
J-M Chempac Folded Gaskets designed for glass lined equipment. Asbestos-Teflon base gives them high sealing effectiveness against a wide range of chemicals.

J-M Chempac Spirotallic Flange Gaskets for perfect sealing in high temperature and pressure service, constructed of interlocked plies of metal and Teflon-Asbestos.

*Trade Mark of DuPont Tetrafluoroethylene resin

Free Folder gives complete details on Chempac-Interlocked and other J-M Chempac Packings and Gaskets for the chemical and process industries. For your copy of folder PK-80A write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

Johns-Manville PACKINGS & GASKETS



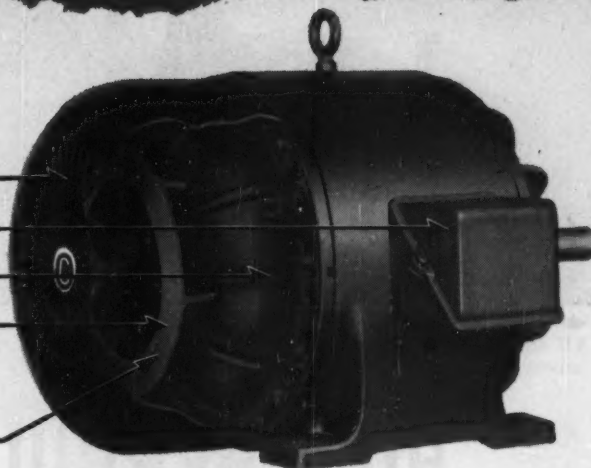
HERE'S WHY

Century Performance Rated CHEMICAL MOTORS

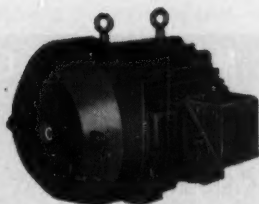
give you increased dependability...
by matching your job needs

**These Performance Rated features
resist chemical corrosion**

- Cast-iron fan guard
- Cast-iron terminal box
- Cast-iron frame and end brackets
- Either bronze or aluminum fan available to you
- Fan constructed to operate in either direction of rotation



Rib type construction available with or without steel covering shroud in sizes 50 to 100 H.P. Steel fan guard.



Dual frame type available in 3 to 40 H.P. sizes



"Air-over-motor" type in 1-1/2-2 H.P. sizes. Steel frame.



Performance Rated motors are offered by CENTURY to match the motor to the job. The lowest cost motor is the properly applied motor. The wide range of sizes and other features in Century's Performance Rated line means you get Century motors application engineered to match whatever equipment you want to drive.

Mail this coupon to find out how Century Performance Rated motors can help you on your current project.

TO Century Electric Co. 1806 Pine Street, St. Louis 3, Mo.

Send me information about

☐ Chemical motors

☐ The Century Performance Rated line

☐ NEMA motor Re-rating frame dimensions

Name.....

Company.....

Address.....

City..... Zone..... State.....

Performance-Rated

MOTORS

1/8 to 400 H.P.

CENTURY ELECTRIC COMPANY

871

1806 Pine Street St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

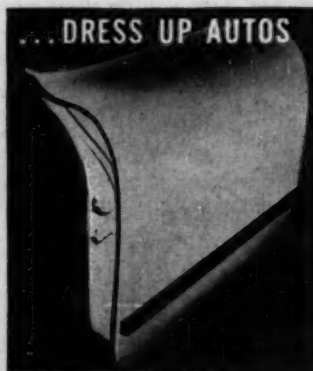


◆ **LEARN BY DOING**—Each year thousands of boys and girls learn how to become better farmers and better citizens through 4-H Awards Programs, such as the Entomology Program sponsored by Hercules. Top awards are college scholarships. Hercules' interest in improved farming methods stems from its development of agricultural chemicals, notably toxaphene for insecticides.

HOW HERCULES HELPS...

Most businesses are helped today by Hercules' business . . . the production of synthetic resins, cellulose products, chemical cotton, terpene chemicals, rosin and rosin derivatives, chlorinated products, and many other chemical processing materials—as well as explosives. Through close cooperative research with its customers, Hercules has helped improve the processing or performance of many industrial and consumer products. We welcome the opportunity to work with you.

STANDARD MODELS and plastic-bodied sports cars alike rely on nitrocellulose lacquers for durability and beauty. In the manufacture of these polyester laminates, such as this car door, Hercules hydroperoxides act as the catalyst in their polymerization.



◆ **WHITER, BRIGHTER CLOTHES**—Hercules® CMC is a key ingredient in detergents . . . suspends soil, prevents its redeposition on clothes. This excellent property of suspension enables Hercules CMC to serve in a variety of consumer and industrial products.

HERCULES

HERCULES POWDER COMPANY

INCORPORATED

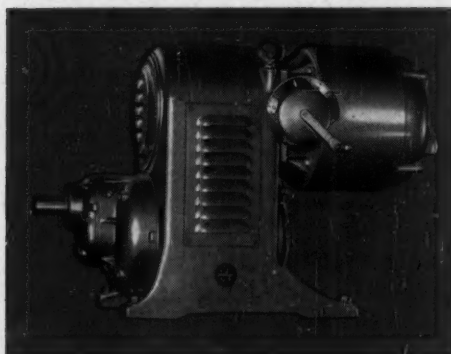
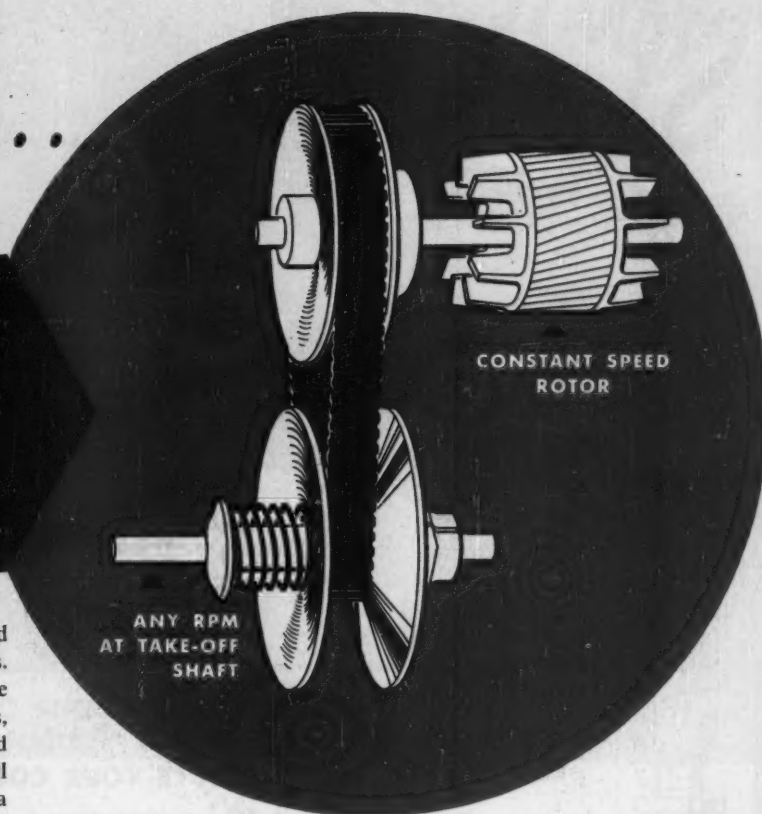
952 Market Street, Wilmington 99, Delaware. Sales Offices in Principal Cities.

035-1

For Variable Speeds...

Simplicity Unequaled

You don't have to resort to complicated mechanisms when you want variable speeds. By adopting the U.S. Varidrive motor you have the simplest of variable speed arrangements, devoid of complex electronic or involved contrivances that require skilled labor to install and to maintain. The Varidrive consists of a built-in motor operating at constant speed and an internal speed-changing transmission that converts the speed to any rpm by merely turning a control dial, all in one "package," all on a single base. Varidrive dependability has been proved by more than 20 years of highly successful performance. For unequaled simplicity, the very wise choose Varidrives.



2 to 10,000 rpm
1/4 to 60 H.P.

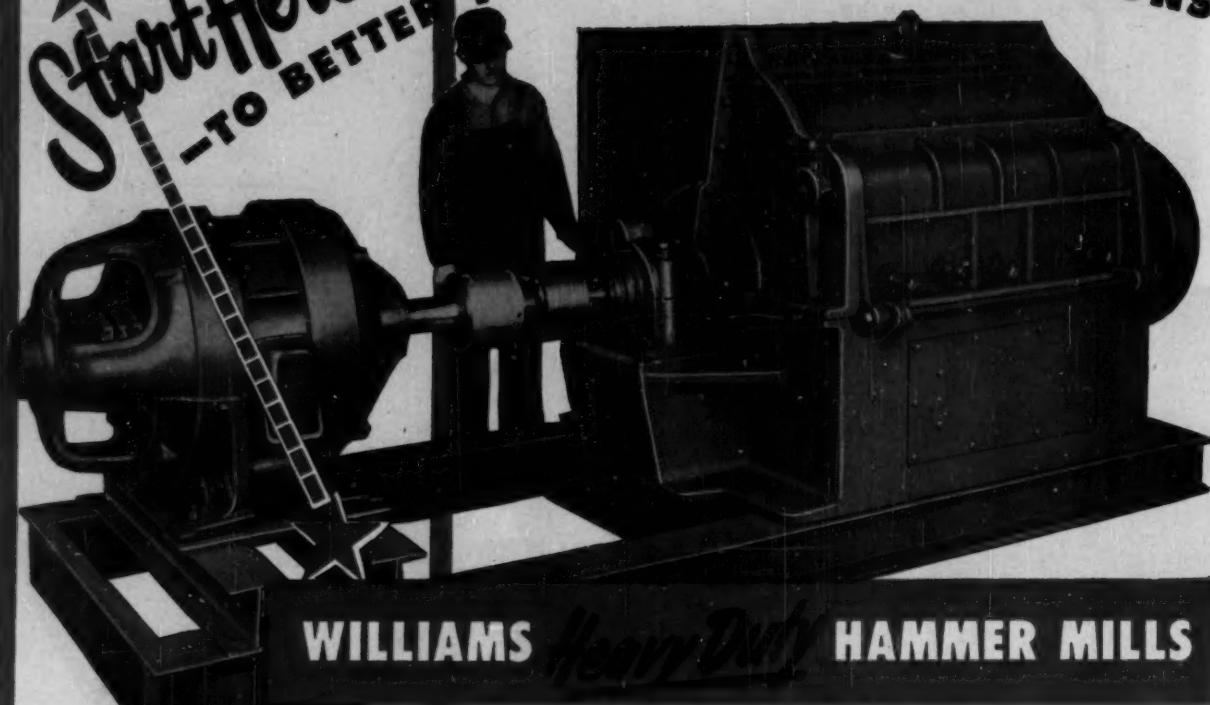
U.S. VARIDRIVE *The Miracle Motor*

Mail Coupon for 16-page Varidrive Booklet ▶

	U. S. ELECTRICAL MOTORS Inc.		CE-1
	P.O. Box 2058, Los Angeles 54, Calif. or Milford, Conn.		
	Name _____		
	Company _____		
	Address _____		
City _____		Zone _____	State _____

★
Start Here
—TO BETTER—

YOUR GRINDING OPERATIONS



WILLIAMS *Heavy Duty* HAMMER MILLS



OTHER WILLIAMS EQUIPMENT

▲ **ROLLER MILLS**
—IMPACT and DRYER MILLS
—for fine grinding to 400 mesh or micron sizes



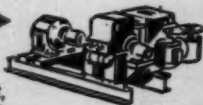
▲ **AIR SEPARATORS**
—any type; for precision control and high production in fine grinding



▲ **VIBRATING SCREENS**
1 to 3 decks, — in any size for any job. open or enclosed.

▲ **HELIX-SEAL MILLS**

—for dust-free grinding, and for wet, sticky, greasy materials.



Also: COMPLETE "Packaged" PLANTS for crushing, grinding, separating.

- ★ **INCREASE YOUR OUTPUT**
- ★ **IMPROVE PRODUCT QUALITY**
- ★ **REDUCE YOUR COST-PER-TON**

★ No matter how tough your grinding, crushing or shredding job—no matter what the material; mineral, vegetable, chemical or animal—there's a Williams Hammer Mill engineered especially to get the finished product you want in a single operation—A SAVING UP TO 50% IN PRODUCTION COSTS! Extra primary and secondary crushers are unnecessary—foundations and buildings for additional machines, drives, conveyors and other equipment are eliminated—A SAVING UP TO 75% IN EQUIPMENT COST!

Many Williams exclusive design and construction features assure greater accuracy to meet the most difficult product specifications—and promise continuous satisfactory performance under the most severe operating conditions with an absolute minimum of maintenance.

Consult with Williams about increasing your grinding output and reducing your costs. Tell us about your operation at the time you Write For Complete Catalog.

★ **WILLIAMS TESTING LABORATORY WILL HELP YOU**

Complete testing and research facilities are maintained by Williams to find the right answers for you on every size reduction problem. Write for information.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.

2706 N. 9th St.

★ ★ ★

St. Louis 6, Mo.

WILLIAMS

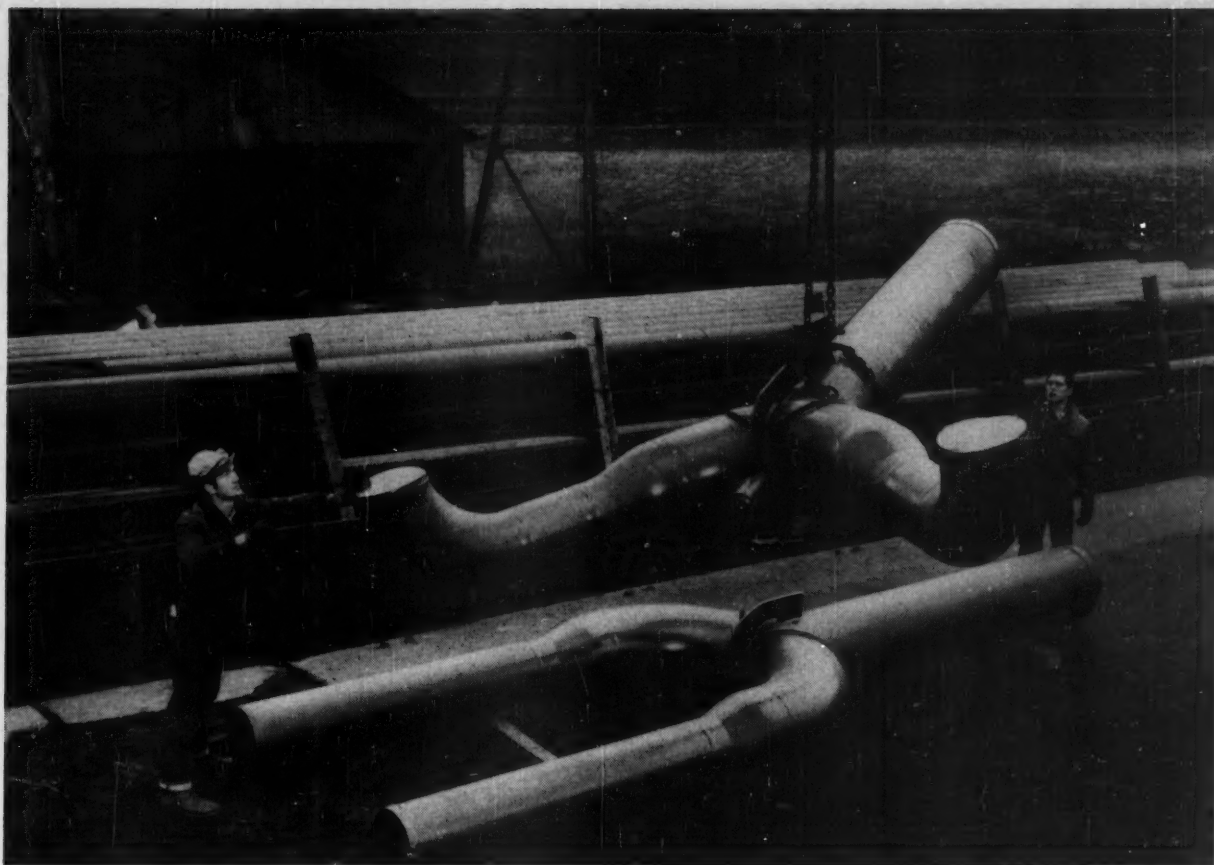


CRUSHERS

GRINDERS

SHREDDERS

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD



1000° hot reheat mixing chamber ...ready for shipment to Plant Hammond

This large complicated 1¼% chrome, ½% molybdenum assembly . . . completely shop fabricated by the Power Piping Division of Blaw-Knox . . . is the third unit to be shipped to Georgia Power's 300,000-kw Plant Hammond at Rome, Georgia.

It's the complex type of job that would be practically impossible to assemble in the field. For instance, it required the most modern shop facilities, as well as great skill, in the fitting and welding of the large reinforced special nozzle well . . . to insure perfect alignment and prevent distortion.

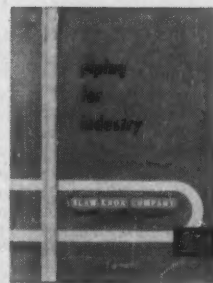
When installed, this unit will be a vital part of a power piping system which will consist of 250,000 feet of pipe, ranging in size from ¼ inch to 24 inches. Sizes 2½ inches and larger were shop fabricated . . . smaller sizes were field fabricated.

This entire system is being fabricated and erected by Blaw-Knox . . . the kind of service which is readily available to you through our Power Piping Division.

Just tell us your requirements and we'll provide the service you need.

BLAW-KNOX COMPANY

*Power Piping and Sprinkler Division
Pittsburgh 33, Pennsylvania*

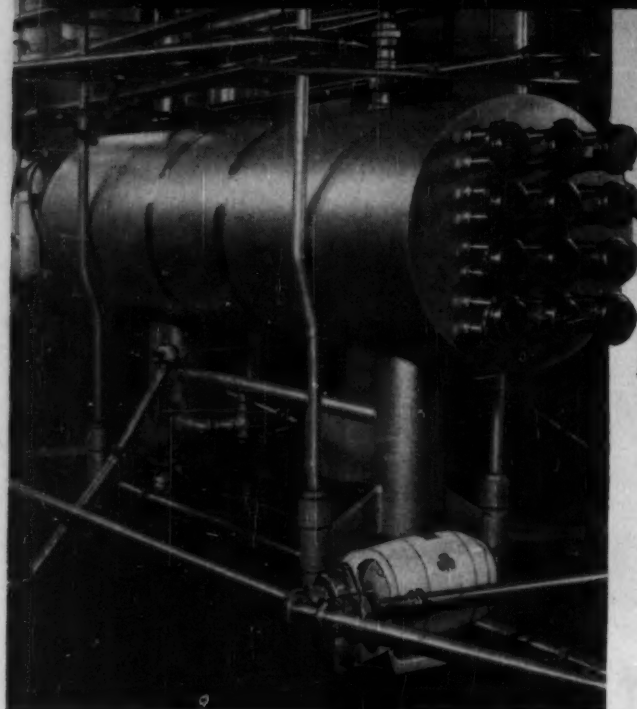


POWER PIPING

Complete prefabricated piping systems for all pressures and temperatures . . . plus complete line of functional spring hangers constant support spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators

To get more information on piping for industry, write for your copy of Bulletin No. 2443.

TRI-CLAMP "Return Cups" provide simple, fast disassembly for cleaning CHESTER-JENSEN HEATER



... can be used for
"take-down" or
cleaned-in-place service

• This Chester-Jensen Heater is unique in that it does not employ conventional methods of return flow. Instead, a stainless steel return cup takes the place of complex return covers or fitting assemblies. The return cup is held in place with a simple TRI-CLAMP toggle union.

The advantages of these Tri-Clover snap-action clamps are obvious—faster, simpler original assembly at lower cost—and speedy disassembly for cleaning, inspection, or replacement.

While this is a specialized application of the exclusive Tri-Clover TRI-CLAMP principle, the same basic advantages apply to the full line of TRI-CLAMP stainless steel ells, crosses, tees, laterals, etc., for use in either "take-down" or cleaned-in-place lines. When installed in "take-down" lines, the "easy on and off" feature means a tremendous savings in labor at wash-up time. When used in C-I-P lines, Tri-Clamp fittings offer important savings in both original cost and in maintenance expense.

Included on the Chester-Jensen heater system is the Tri-Clover "Pump King," one of a complete line of Tri-Clover sanitary pumps—that years of service have proven will out-perform and out-last any other centrifugal pumps available to the dairy industry. These pumps feature: *Wide choice of seals—Design that actually exceeds 3A sanitary standards—Streamline heads for faster assembly and disassembly—Patented impeller for higher efficiency—Pump heads that can be turned 360 degrees to simplify installation*—and many other features which make it the most "copied" pump in the industry. For full details, send for Pump Catalog 253.

LADISH CO.

Tri-Clover DIVISION
KENOSHA WISCONSIN

SEND FOR NEW CATALOG

Complete details and specifications covering the full line of TRI-CLAMP Stainless Steel Fittings are available in the new Tri-Clover Catalog 1-154. Send for your copy today.

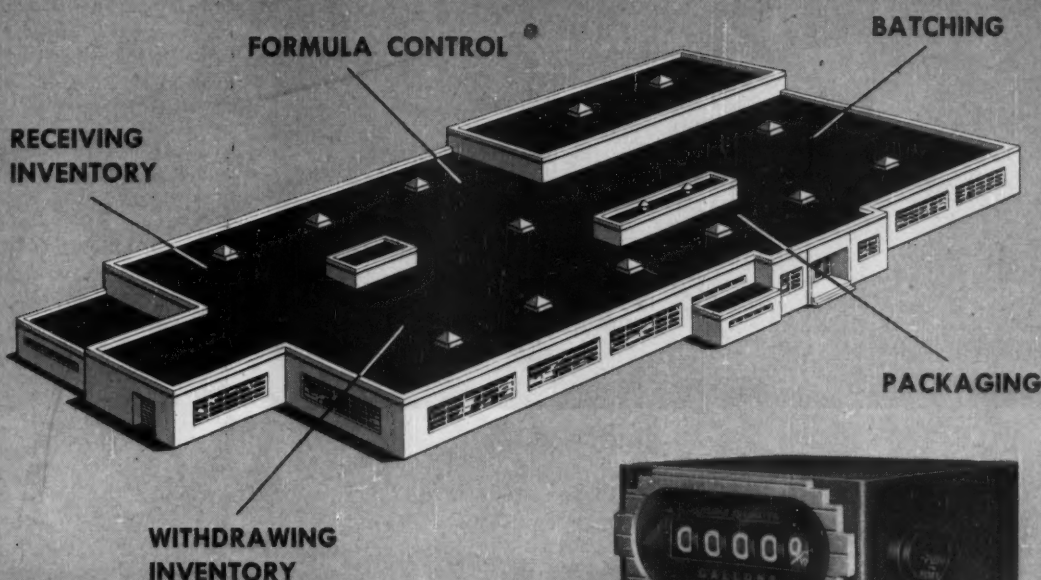


See your nearest TRI-CLOVER DISTRIBUTOR

EXPORT DEPT., 8 So. Michigan, CHICAGO 3, U.S.A. Cable: TRICLO, CHICAGO

\$155

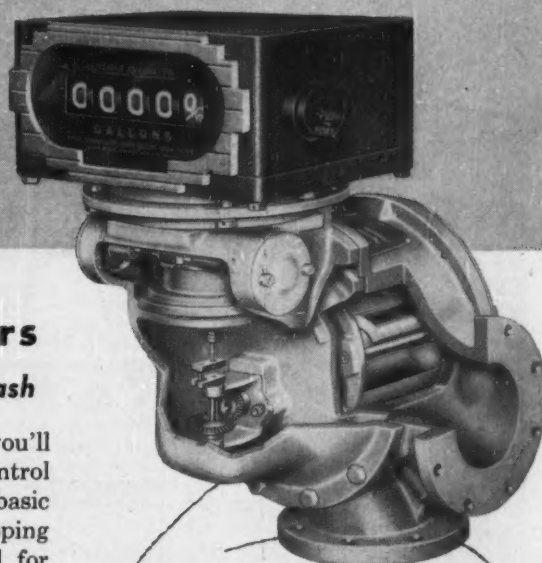
Accounting at Every Liquid Handling Point



Rockwell Industrial Meters

Guard Your Liquids as You Guard Your Cash

Put Rockwell Industrial Meters to work. Then you'll control your costs . . . control your processes . . . control your end product quality. Rockwell meters are basic accounting tools for verifying purchases, for stopping losses, for inventory and departmental control and for tax analysis purposes. They will accurately measure most any liquid that can be piped. Available in all sizes and several types for every requirement. For full details use coupon or write.



ROCKWELL ROTOCYCLE METER
Cutaway to show the all-revolving rotor construction

"316" Stainless Steel Meter

FOR CORROSIVE LIQUIDS

This meter, made entirely of type 316 stainless steel is the answer to many a measurement problem in the Food, Chemical, Drug and Industrial Processing fields. It resists corrosion. Made in two sizes rated at 100 and 200 gpm. Quantity control valves, strainers and a variety of registers available. Described in bulletin OG-406.



YOU CAN RELY ON ROCKWELL

CLIP COUPON—MAIL TODAY

ROCKWELL MANUFACTURING COMPANY
Pittsburgh 8, Pennsylvania

104B

Gentlemen:

I am interested in measuring _____

(Name of Liquid)

Pipe Size _____"

Working Pressure _____ psi

Temperature _____ °F max.

Max. Flow Rate _____ gpm

Min. Flow Rate _____ gpm

YOUR NAME _____

COMPANY _____

STREET _____

CITY _____

ZONE _____ STATE _____



CONNECTED BY A MAGNET! The idea of an Eriez Magnet powerful enough to connect a locomotive to a freight car it is pulling, finds a practical aspect in industry. So powerful are Eriez Magnets that they can snatch deeply buried tramp iron out of material passing at high speeds on processing lines. The result is a prevention of fires, machinery damage and product contamination. *All Eriez Magnets are non-electric, self-contained. They operate without any wires or attachments. Best of all their magnetic power lasts a lifetime. The first cost is the last.*

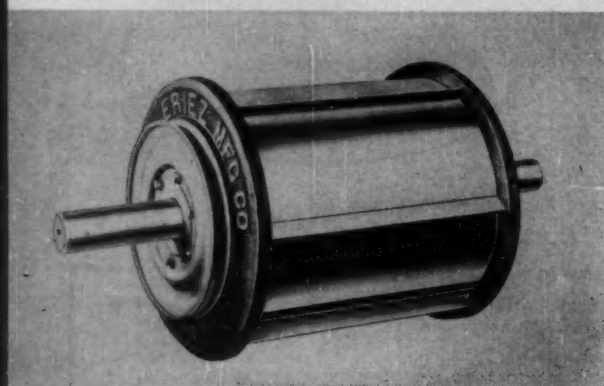
Magnetic ideas from **ERIEZ**



A POUND A DAY KEEPS THE REPAIRMAN AWAY. A 36" Eriez Plate Magnet at the Tetley Tea Company plant picks up about a pound a day of nails, bolts, screws and other tramp iron. The Eriez installation protects the bag machinery . . . and is saving about \$5,000 a year . . . and is saving about 200 man hours annually . . . and is increasing production! Besides the plate magnet shown, four other efficient Eriez Magnets have been in operation at the famous tea plant since 1950.

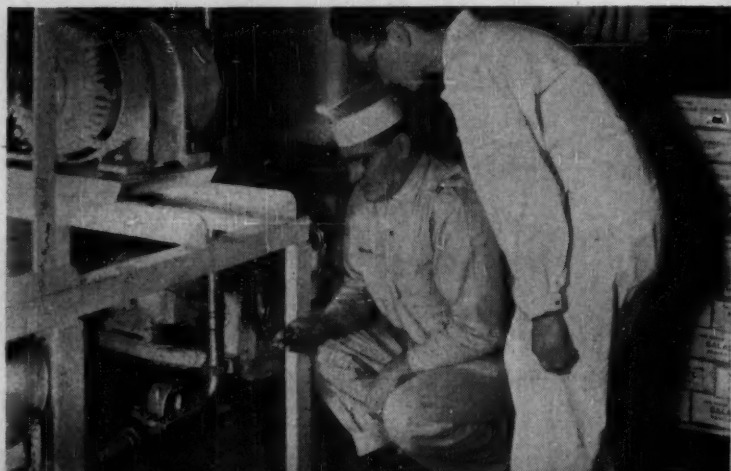


HORSE SENSE FOR HORSE-RADISH. Thor-Shackel Horse-Radish Co., Chicago, installed this sanitary Eriez Pipeline Trap just ahead of the pumps that move the product to the filling machines. The trap assures a product free from metal contamination and also increases production. Previously, any small bits of metal would jam the pump impellers. This would mean a delay of up to an hour and the loss of horse-radish removed from the vat to allow the fans to be cleared. The Eriez Pipeline Trap has eliminated all pump failures caused by tramp iron mixed with the horse-radish.



YOU CAN'T BEAT THIS DRUM. The Eriez Magnetic Drum is an unbeatable unit for extracting tramp iron from materials conveyed in spouts, chutes, spiral conveyors, etc. Consisting of units with or without housing, the Eriez Drum is a revolving shell inside of which are powerful Alnico V elements which pull tramp iron from wet or dry material thereby preventing fires, machinery damage and product contamination. Want more information on this product? . . . request Bulletin B-601.

Eriez "Magnetic Ideas" can help you. Eriez' factory-trained field men, backed by Eriez' laboratory and engineering know-how, will be happy to study your particular problem, make a plant survey and offer helpful "Magnetic Ideas". Write or call Eriez Manufacturing Company, 74P Magnet Drive, Erie, Pa.



Eastern Mixers lick the *Tough* problems...



LABORATORY STIRRER



LARGE TOP-ENTERING
TURBINE MIXER

There's an Eastern Mixer to handle every fluid mixing problem. Whatever your process is, Eastern will work out the problem to your complete satisfaction, and at moderate cost, in nearly every industry engaged in processing of liquids. Eastern engineers have repeatedly scored triumphs over troublesome and unusual problems.

Eastern Mixers come in a variety of sizes and types. From tiny laboratory stirrers weighing less than a pound, to giant turbine mixers, Eastern equipment runs the gamut of needs for all-size mixing jobs.

Variable speed laboratory STIRRERS are constructed for hard, continuous usage. PORTABLE MIXERS are available with large variety of choices in styles, horsepower, motors, and mounting arrangements. TOP AND SIDE ENTERING MIXERS with fixed-mounting take care of the big jobs. Paddle propeller and turbine type units are available in a large variety of sizes and ratings.

When anticipating the purchase of fluid mixing equipment, send for Eastern Data Sheets. Our engineering staff will specify the most efficient units complying with the data of your particular problem.

Request 4 helpful catalogs by writing for Catalog Series 17.

Eastern



INDUSTRIES, INC.
REGENT STREET
EAST NORWALK, CONN.



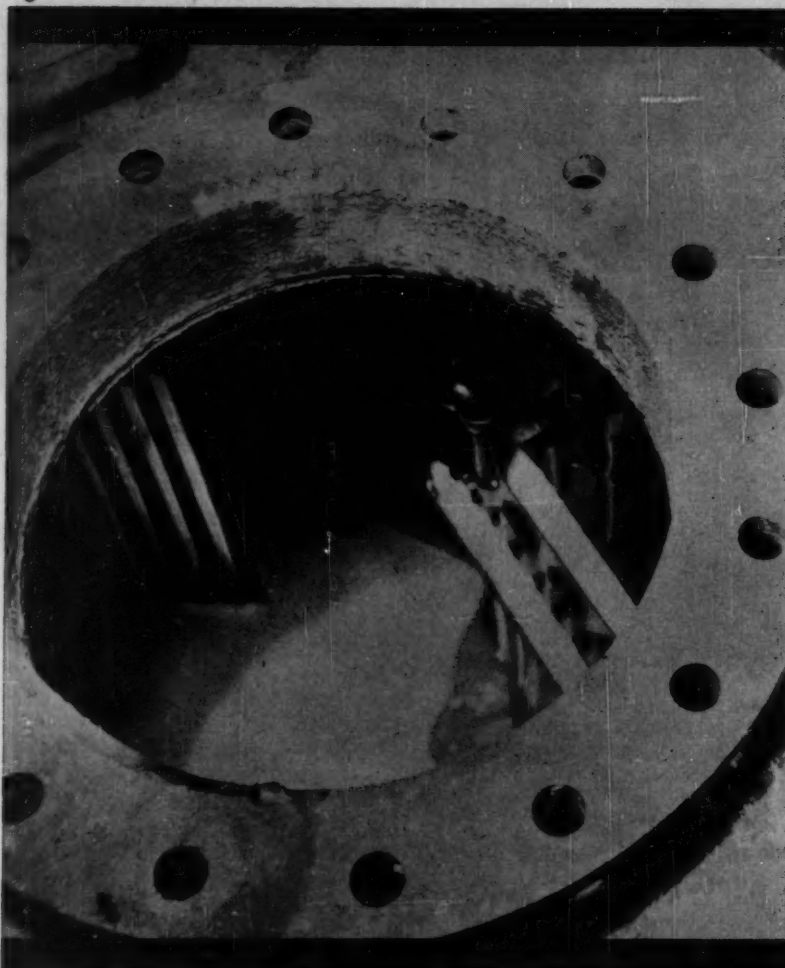
PORTABLE MIXER



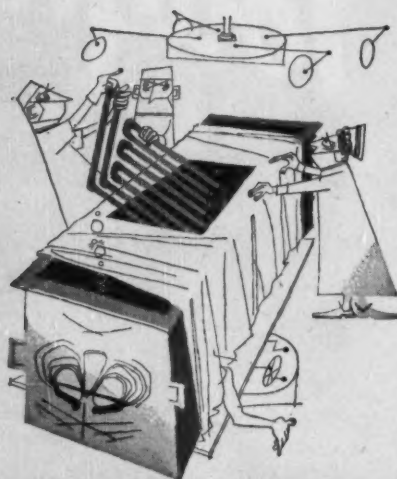
SIDE-ENTERING MIXER

new **PLATECOILS**[®]

cost less than pipe coil repairs...

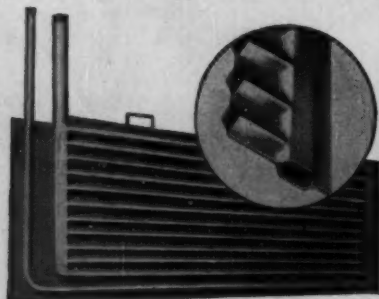


as Coil-itis*
is cured in
this
Sherwin-Williams
agitated tank



Platecoils have replaced a large circular pipe coil formerly used to cool alkaline slurry in an agitated tank at Sherwin-Williams Company. Installed on end, Platecoils are inserted or withdrawn through a manhole on the top of the tank. With pipe coils, it was necessary to remove the motor and agitator and the bolted-down tank top to make repairs. Cost of doing this just once exceeded the total cost of the 6 Tranter Platecoils now used. In addition, cooling is now accomplished with-

out fouling of surface, which means the cooling is more effective and maintenance is decreased. Such outstanding savings are possible with Platecoils. Investigate them for your processes today. For heating as well as cooling, Tranter Platecoils are your best answer.



PLATECOILS replace pipe coil for 50% of the cost

*Besides reducing original costs, Tranter Platecoils frequently save 50% in maintenance costs. And production time is saved because Platecoils heat or cool 50% faster and payloads are increased because Platecoils take 50% less tank space. By overcoming the limitations of old-fashioned pipe coils, Platecoils cure Coil-itis.

Write today for a 12-company report on savings made by use of Tranter Platecoils. Ask for Bulletin No. P61.



PLATECOIL Div. **TRANTER MANUFACTURING, Inc.**, Lansing 4, Michigan

T F

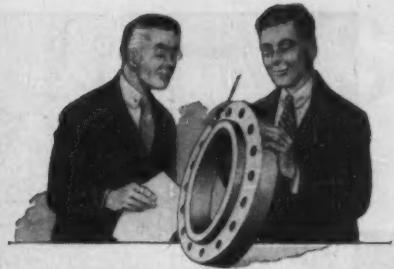
The WeldELL® line — the first full line of seamless butt-welding fittings — gave the "go" signal to modern pipe welding.

Get your Taylor Forge Distributor for up-to-the-minute facts

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works: P.O. Box 485, Chicago 90, Illinois

Offices in all principal cities • Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada



We had to quit guessing in the twenties

The founder of Taylor Forge used to say that "uniformity of strength should be the final goal of every engineer"... and no doubt this kind of thinking motivated the Taylor Forge organization to take so much initiative in the development of forged steel components for pressure piping.

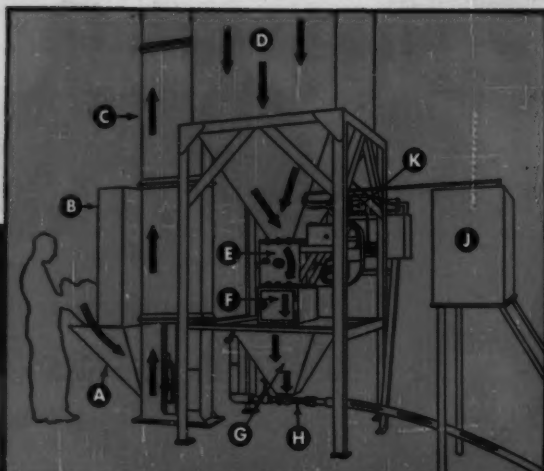
The pattern was set in the twenties. Before 1920 little had been done in the way of pipe fitting and flange standardization. As early as 1905, however, Taylor Forge had produced forged steel flanges for Taylor pipe, and they had proved so superior to cast iron flanges that within a few years more flanges were being made for others than for our own use. But these forged flanges were bolted to the iron flanges of valves, pumps, and the like; so they simply followed cast iron standards.

In view of the obviously far greater strength of forged flanges, this was foolishly safe, and patently not at all in the "Uniformity of Strength" tradition. Moreover, in the twenties pressures were starting their upward climb. The 125 lb. and 150 lb. standard wouldn't do. Now it was 400; then 600; then 900 pounds. As the pioneer and leader in this field, Mr. Taylor saw the need for formulating standards and went to work on it.

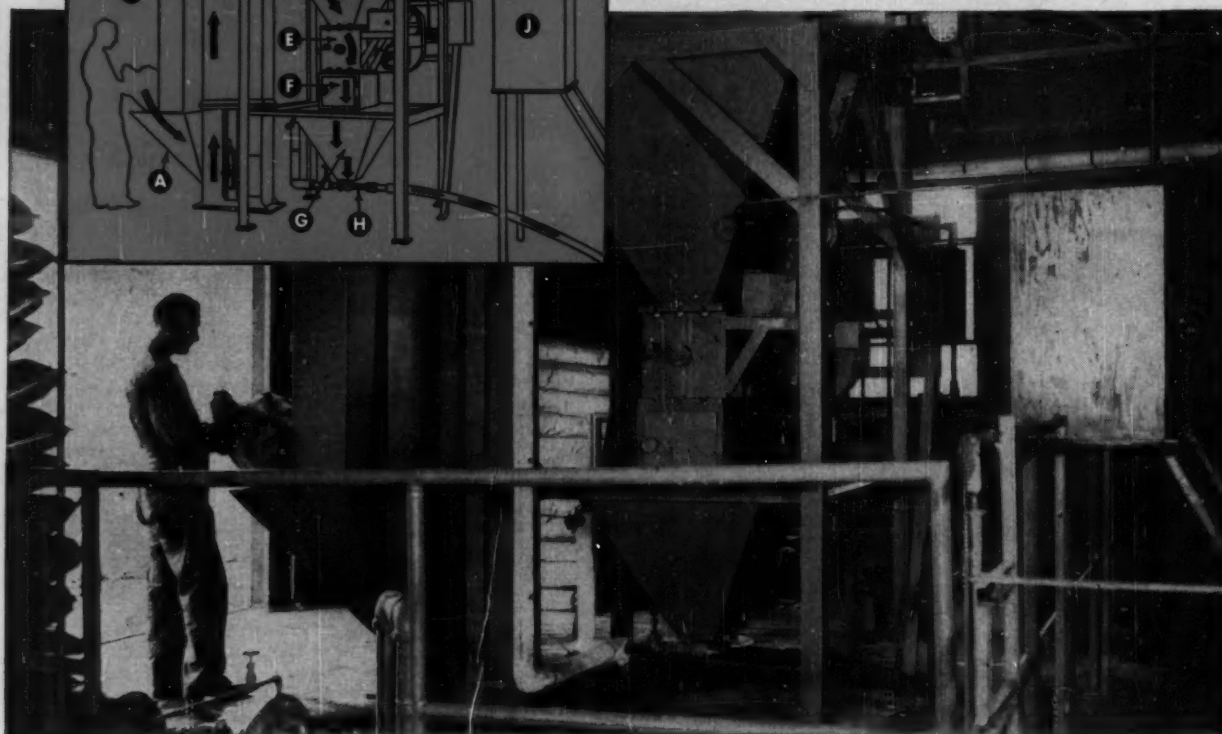
Although one of the first studies conducted in this field, his work ranks to this day as one of the most thorough jobs ever done. In this work Mr. Taylor was in touch with Mr. Sabin Crocker, who is author of today's "Piping Handbook." He also collaborated with Professor E. O. Waters of Yale. Mr. Taylor ran exhaustive full scale tests on actual flanges to provide the test data which was then analyzed and formulated by Mr. Taylor and Professor Waters. The result was the Taylor-Waters Formula, presented before the ASME in 1927.

Still found in every engineering handbook, the Taylor-Waters formula was, and is, the basic means of determining flange stress under a given condition of loading. In the years since, Taylor Forge has also played a leading part in bringing standards into correlation with broadening needs... but this is another story.

**An episode in the story of
Taylor Forge leadership in designed piping**



Omega Continuous Chemical Feeding System includes: (A) loading hopper, (B) dust collector, (C) bucket elevator, (D) storage hopper with low level alarm, (E) Rotolock Feeder, (F) inspection chute, (G) dissolving chamber, (H) ejector for delivering chemical solution to raw waste channel, (J) pH controller, and (K) pneumatic positioner for varying feed rate in proportion to pH.



CONTINUOUS WASTE NEUTRALIZING THE EASY, OMEGA WAY

WOLVERINE TUBE Division of Calumet & Hecla, Inc., at Decatur, Ala., uses this Omega Continuous Chemical Feeding System to neutralize acid pickle liquor wastes. As shown in the drawing, the system is a "load it, forget it" combination of standard Omega units engineered for continuous, automatic operation. Soda ash is fed by an Omega Rotolock Feeder in response to a pH Controller — at rates varying over a 15 to 1500 lbs. per hr. range. The Rotolock Feeder's high volumetric

accuracy (within $\pm 1\%$) and wide range insure proper waste neutralization under all flow conditions.

This system—selected from the many available Omega chemical feeding "equipment packages"—was engineered in cooperation with Howard, Hickerson and Jordan, Engineers-Architects, of Nashville, Tenn. Omega welcomes the opportunity of working with you and your engineers in the application of Omega Feeders to your chemical feeding problems.



OMEGA THE LAST WORD IN FEEDERS
DIVISION OF B-I-F INDUSTRIES, INC.



OMEGA MACHINE COMPANY, 369 B Harris Ave., Prov. 1, R. I.

- ☐ Send Bulletin 45-H8 describing Omega Rotolock Feeders.
- ☐ Send "Industrial Waste Treatment Guide" (Bulletin BIF-4A)—also details on other Omega waste treatment "packages".

Name.....

Company.....

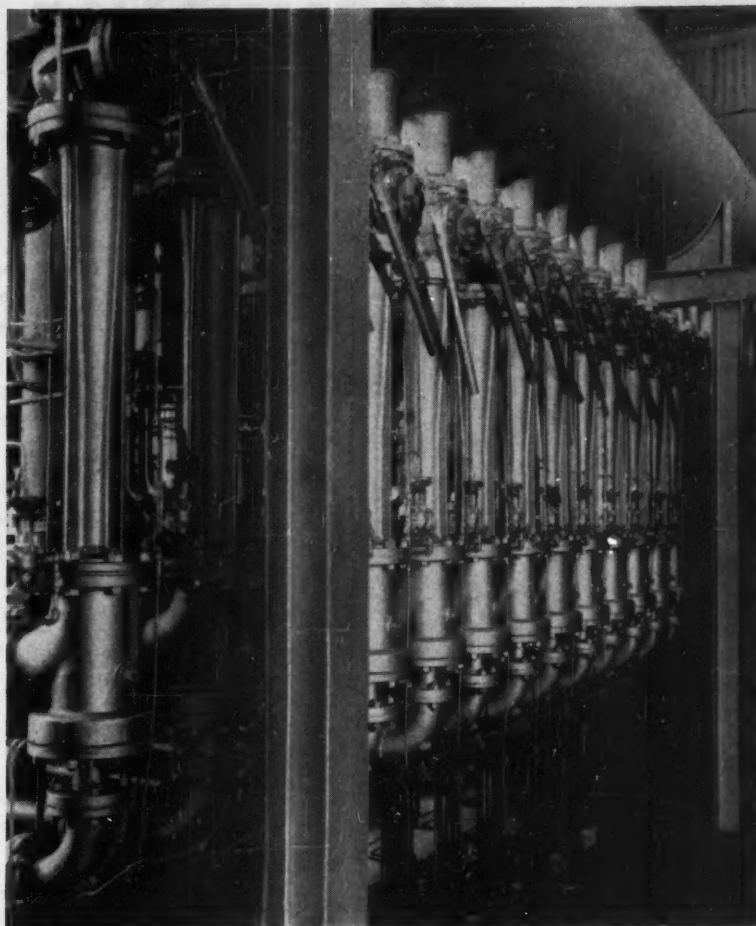
Street.....

City..... State.....

Our chemical feeding problem involves

*Send
Coupon*

PIPE ORGAN FOR HOT TUNES



I-R Ejector Jets automatically maintain desired BTU content of gas mixture for firing metallurgical furnaces at Fairless Works.

The pipes in this "organ" produce no music. Yet the steady roar of gases which they control is music to the ears of the utility men at U. S. Steel's new Fairless Works. For this bank of fifteen I-R ejectors plays a major role in keeping the furnace fires burning at constant, high efficiency.

The reheating and pit furnaces at Fairless normally burn coke oven gas. At times, however, there isn't enough of it and natural gas must be introduced as fuel. If the natural gas were burned in its virgin state the burners would have to be readjusted every time, since coke oven gas has only half the BTU value of natural gas. That's where the jets come in. They mix just enough air with the natural gas to give it the same heat flow factor as coke oven gas. The

natural gas is expanded through the nozzle of the jet, picking up air through the suction. Gas flow is regulated automatically according to load requirements by cutting any of the fifteen jets into or out of the system.

This is another example of how Ingersoll-Rand experience in the design and engineering of steam jet ejectors was able to solve a specific operating problem. The same time-saving, cost-saving service is available for *your* problems, too. Just call your nearest I-R representative or branch office.

Ingersoll-Rand

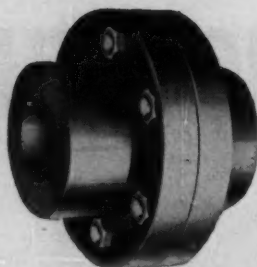
4-86 11 Broadway, New York 4, N. Y.



PUMPS • COMPRESSORS • GAS & DIESEL ENGINES • ROCK DRILLS • VACUUM EQUIPMENT • AIR & ELECTRIC TOOLS & HOISTS

JEFFREY

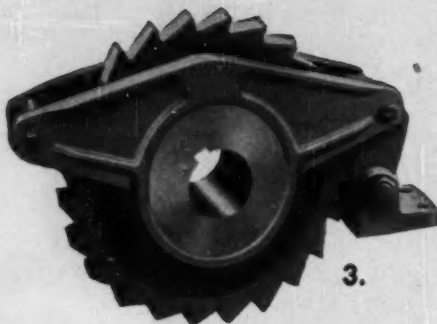
transmission parts for perfect performance



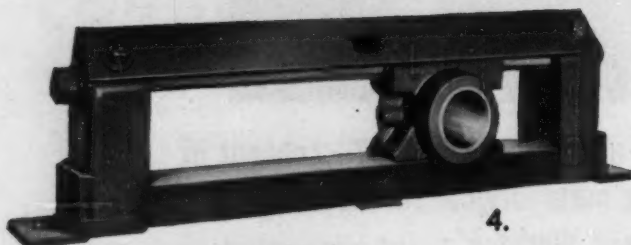
1.



2.



3.



4.



5.

Modern conveyors demand perfect performance from even the smallest part. That's why Jeffrey's smaller replacement parts—like Jeffrey heavier equipment—are all masterpieces of precision and design. Each is made of the best metal for the service, properly treated and formed for accurate balance, close tolerance, smooth surfaces and long, trouble-free service. Your conveyor replacement needs can all be met from one source—Jeffrey! Most parts are now in stock, ready for immediate shipment.

Write for technical literature

1. **JEFFREY SHAFT COUPLINGS:** Pin and Belt Flexible Type . . . Flanged . . . Oldham Type.
2. **JEFFREY SET COLLARS** of the accepted safety type: Split or Solid Cast Iron . . . Solid Steel . . . machine faced and bored true.
3. **JEFFREY HOLDBACK,** Friction Type . . . also Differential Band Brake, Silent Ratchet Safety Lock and Solenoid.
4. **JEFFREY DS TAKEUP** with Babbitted Bearing . . . also Ball, Roller or Bronze Bushed . . . self-aligning . . . positive adjustments.
5. **JEFFREY PILLOW BLOCKS** are available in many types and sizes: Solid or Split Journal . . . Hollow Dowel . . . Babbitted Anti-friction Roller Bearing . . . various flanges.



THE JEFFREY MANUFACTURING CO.

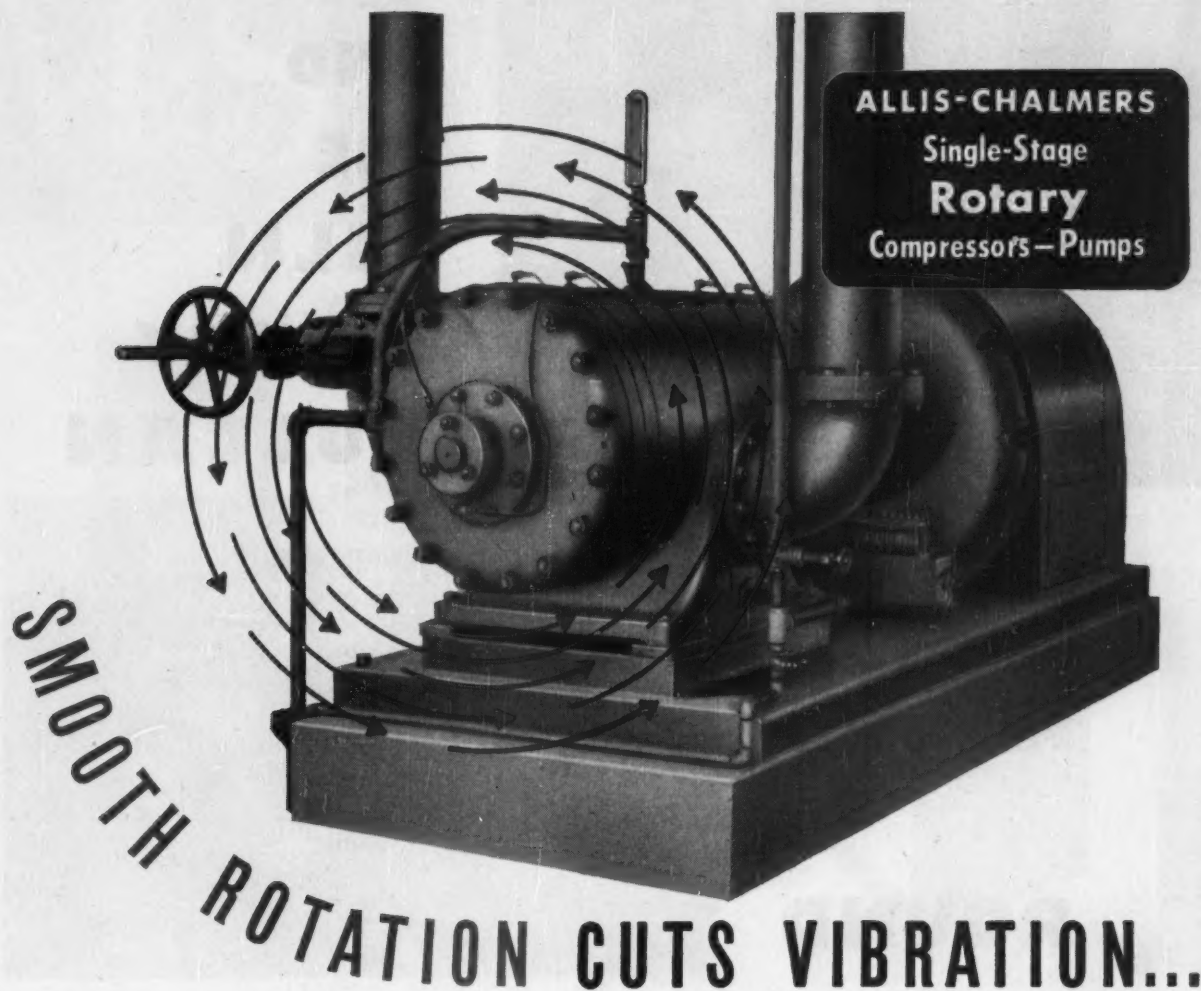
ESTABLISHED 1877

Columbus 16, Ohio

*sales offices and distributors
in principal cities*

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

BELT IDLERS—all types • PULLEYS • GEARS • TAKEUPS
SHAFTING • SET COLLARS • DRIVE CHAINS • PILLOW BLOCKS
SPROCKETS • COUPLINGS • HOLDBACKS • BELT CLEANERS



cuts foundation costs

Allis-Chalmers rotary compressors and vacuum pumps run so smoothly, heavy foundations aren't needed.

Single-stage *Ro-Flo* design eliminates the shock and vibration inherent in reciprocating designs. Result: small *Ro-Flo* units can be bolted directly to the floor; large ones need only a simple slab.

Elimination of shock and reduction of vibration mean less wear and tear on parts in the *Ro-Flo* unit. In addition, there are no valves and piston rings to require maintenance.

Rotary Motion is the Modern Motion

For low foundation costs, low maintenance and smooth, pulsation-free air flow, use the modern Allis-Chalmers rotary compressors and vacuum pumps. These units are compact, self-contained. They are built in capacities from 40 to 3200 cfm at pressures from 5 to 50 psig.

In addition, A-C can supply motors and control . . . the complete integrated package.

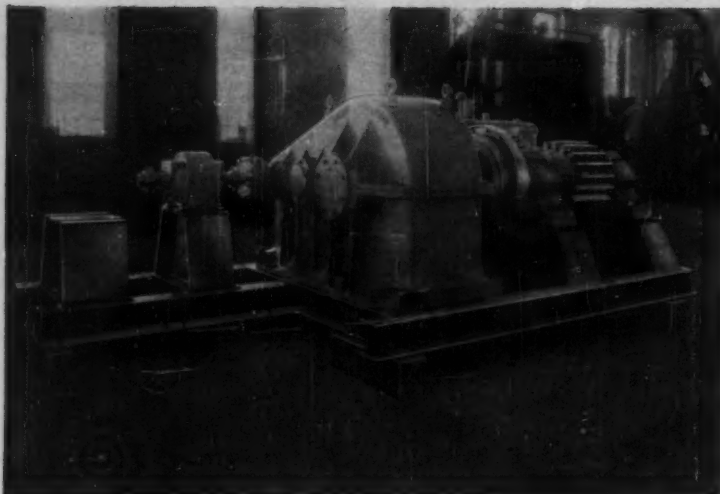
Get complete information. Call your nearest A-C office, or write for new 12-page descriptive bulletin 16B8126. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4469

Ro-Flo is an Allis-Chalmers trademark.

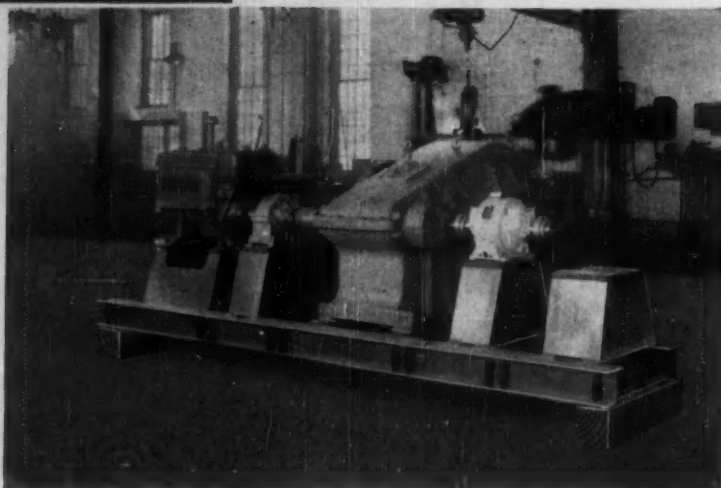
ALLIS-CHALMERS





AND THE KILN BUILT BY VULCAN

**WILL
GO
ROUND
'N
ROUND**



That's just what the above equipment has been built to do: turn a 12'x175' VULCAN Rotary Kiln round and round with the smallest downtime possible. It can be done, and it is being done now, while you read this ad. Hundreds of VULCAN Rotary Kilns are working with a minimum of downtime, because of the experience, the top-flight engineering, and the highest quality material and workmanship built into every piece of equipment necessary to revolve a rotary kiln.

The top view shows the separately mounted main pinion with large flexible coupling between the pinion shaft and reducer, as well as the dynamatic clutch with flexible coupling for attaching to customer's motor.

Bottom view shows the set-up of auxiliary motor with reducer and clutch to the high speed shaft of the reducer. This one piece of equipment, along with all the others necessary to complete a Rotary Kiln installation, has been designed, and was built, by VULCAN.

VULCAN designed, VULCAN built equipment, means good, dependable equipment. Our 105 years of continuous business means EXPERIENCE. When you build, or re-build, contact VULCAN of WILKES-BARRE. Let their experience in design, experience in building, work for you. Estimates, constructive suggestion, and preliminary drawings will be furnished (as far as possible) without obligation. Write for Bulletin A-422 on Rotary Kilns, Coolers, Dryers, Retorts and other dependable processing equipment, TODAY.

Any information on items listed below
will be sent to you immediately:

Rotary Kilns, Coolers and
Dryers
Rotary Retorts, Calciners, Etc.
Improved Vertical Lime Kilns
Automatic Quick-Lime
Hydrators
Briquetting Equipment
Open-Hearth Steel Castings

Heavy Duty Electric Hoists
Self-Contained Electric Hoists
Cast-Steel Sheaves and Gears
Diesel Locomotives
Electric Locomotives and Larrys
Steel Plate Fabrications
Hydraulic Presses

VULCAN IRON WORKS

NEW YORK OFFICE
50 CHURCH ST., N.Y., N.Y.

WILKES-BARRE, PA., U.S.A.
ESTABLISHED 1849

CABLE ADDRESS
"VULWORKS WILKESBARRE"

M·S·A

PROCESS CONTROL INSTRUMENTS



**M·S·A
OXYGEN
INDICATOR
(TYPE C-2)**

Designed to continuously measure the oxygen content of industrial atmospheres, this compact, accurate instrument provides a means for improving safety in utility operations, effecting economies as a measure of combustion efficiency, and aiding in the control of pipe line corrosion. To accommodate all applications, the instrument is available in the following scale ranges: 0 to 1.0%, 0 to 5.0%, 0 to 10%, and 0 to 25%.

APPLICATIONS:

- **Hydrogenation Processes**
0 to 1% Oxygen in Hydrogen
- **Fluid Catalytic Cracking**
0 to 1% Oxygen in Regenerator Flue Gases
- **Inert Gas Control**
0 to 1% Oxygen in Inert Gases
- **Combustion Control**
0 to 1% Oxygen in Flue Gases

Write today for our bulletins, or send along your problem



Call the M·S·A man on your every safety problem
... his job is to help you



**M·S·A
INFRA-RED
GAS AND
LIQUID
ANALYZER
(LIRA)**



For automatic analysis of fluid mixtures, measurement of toxic contaminants in air, precise process control. This device makes a continuous analysis of one component of a mixture. It is extremely stable and accurate which makes it an ideal unit for production control and research problems.

APPLICATIONS:

- **Ammonia Synthesis**
Carbon Monoxide—0-5 ppm at 200 psi;
0-100 ppm at atmospheric pressure
Carbon Dioxide—0-2 ppm at 200 psi;
0-50 ppm at atmospheric pressure
- **Ethylene Product**
Ethylene 95-100%
- **Ethylene Purity**
Acetylene—0-200 ppm; Ethane—0-1/2%;
Methane—0-1/2%
- **Product Loss Control**
Propane—0-2% in Hydrocarbon Stream
Ethylene—0-5% in Hydrocarbon Stream

MINE SAFETY APPLIANCES COMPANY

201 North Braddock Avenue, Pittsburgh 8, Pa.

At Your Service: 76 Branch Offices in the United States

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.

Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver,
Sydney, N.S. • Representatives in Principal Cities
in Mexico, Central and South America

Cable Address: "MINSAP" Pittsburgh

NOW - for Greater Safety!
Explosion-Proof...
Dust Tight...
Rain Tight!



APPLETON Motor Starter UNILETS installed on jacket water and gas coolers, Engine Room No. 2, Main Line Booster Station of Permian Basin Gas Co., Spraberry, Texas.

APPLETON

CIRCUIT BREAKER, MOTOR STARTER AND COMBINATION UNILETS®

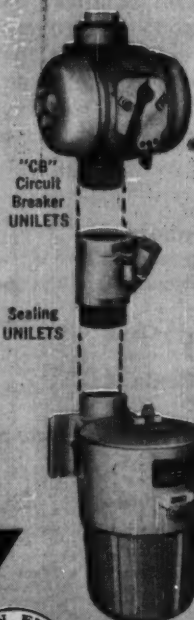
■ For safe, dependable performance in explosive atmospheres, select APPLETON Motor Starter and Circuit Breaker UNILETS with *absolute confidence*.

Proof is industrial plant specification of APPLETON UNILETS *without substitution* for some of the nation's most important petroleum and chemical processing projects. APPLETON UNILETS provide dual safety...during operation and maintenance alike... which eliminates "down time" on other electrical operating equipment while servicing. In addition, you get initial and long term savings, long life, and simplicity of installation and wiring. For additional information, write today.

Sold Exclusively Through Selected Wholesalers

APPLETON ELECTRIC COMPANY
 1742 Wellington Avenue Chicago 13, Illinois

Advantages Found Only With APPLETON!



- FIRST to be U. I. Approved for BANKED Circuit Breaker Grouping
- Combinations Meet U. I. Requirements through Approval of Components
- FIRST to Achieve Safe Entrance to Motor Starter of a Combination without Shutting Off Other Branch Circuits
- Full 7-Thread Explosion-Proof Protection... No Bolts to Strip or Flanges to Nick
- Unmatched Accessibility for Easiest Wiring and Servicing on Every Job
- Light-Weight Construction for Easy Installation without Heavy Lift Equipment
- Quick Interchange on Leading Makes of Circuit Breakers and Motor Starters
- Flexible Field Set-ups Assured with Single and Duplex Male and Female Hub Adapters

PATENT PENDING

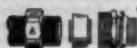


Explosion-Proof Fixtures



Industrial Lights

Also Manufacturers of:



"GT" Series Connectors



Reelites



Outlet Boxes

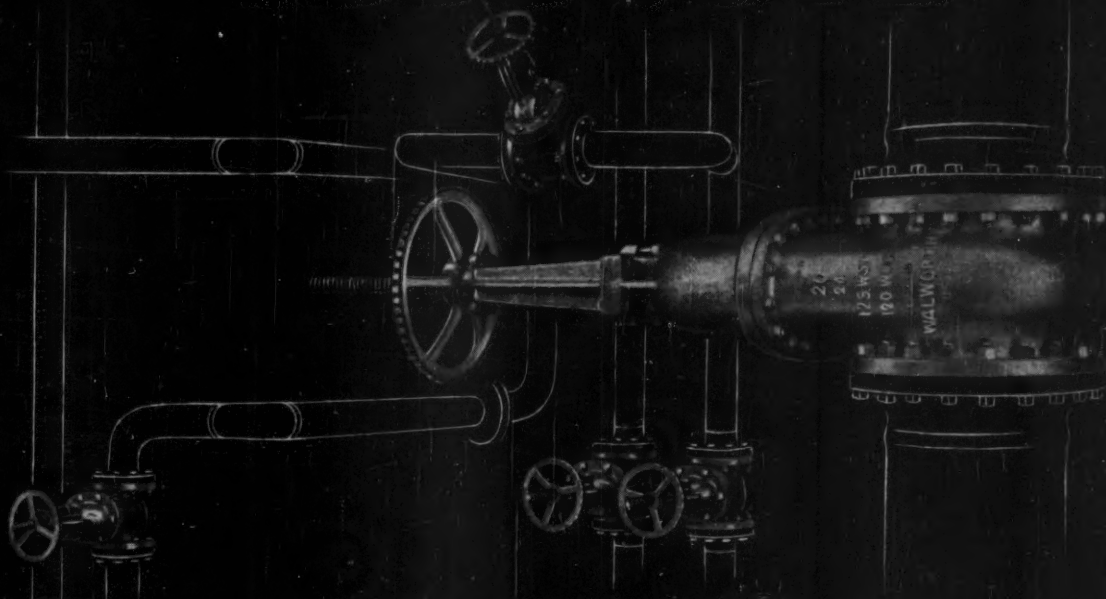


"LS" Motor Starter UNILETS

Rely on **APPLETON**... the Standard for Better Wiring

Write Today For Complete Information

WALWORTH

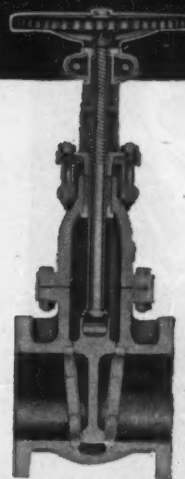


IRON BODY WEDGE GATE VALVES

Better because ...The entire valve, from hand-wheel to seat rings, is ruggedly constructed to withstand rough and frequent usage. Body, bonnet, and yoke are sturdy castings with large radius fillets. Dimensions and drilling of end flanges are in agreement with American Cast Iron Flange Standards. Stiffening ribs connect end flanges with the body neck to maintain a rigid connection with piping.

A wide range of Walworth Iron Body Wedge Gate Valves is available—through your Walworth Distributor—from which you can choose the right type to meet your most exacting conditions. Saddle-type valves as small as $\frac{1}{4}$ -inch; low pressure valves for water and gas pipelines up to 36 inches.

Whenever you need valves and fittings, choose from complete lines—in a variety of metals—manufactured by Walworth. For more information, see your Walworth Distributor or write: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Walworth No. 726F OS&Y (Outside Screw and Yoke) Iron Body Wedge Gate Valve. OS&Y valves are recommended for services where it is desirable that the line fluid does not come in contact with the stem threads. Note the swing-type gland-eye-bolts for easy repacking. Sizes 2 to 30 inches.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Easy working and long life in chemical atmospheres ...for the **Lapp Valve**

Non-ferrous working parts in the Lapp Valve eliminate freeze-ups from scales of corrosion. Threaded stud, yoke bushing and nuts, and plug cap are all brass or bronze, which keep the valve smoothly operative in all but the most unusual conditions of chemical atmosphere. Flange, yoke and gland are of high strength malleable or ductile iron, and are protected with baked-on Epon-base acid-proof paint. Flanges are permanently bonded to porcelain or armor with acid-proof resin cement. *Write for bulletin with complete description, characteristics, and specifications. Lapp Insulator Co., Inc., Process Equipment Division, 311 Wendell Street, LeRoy, New York.*

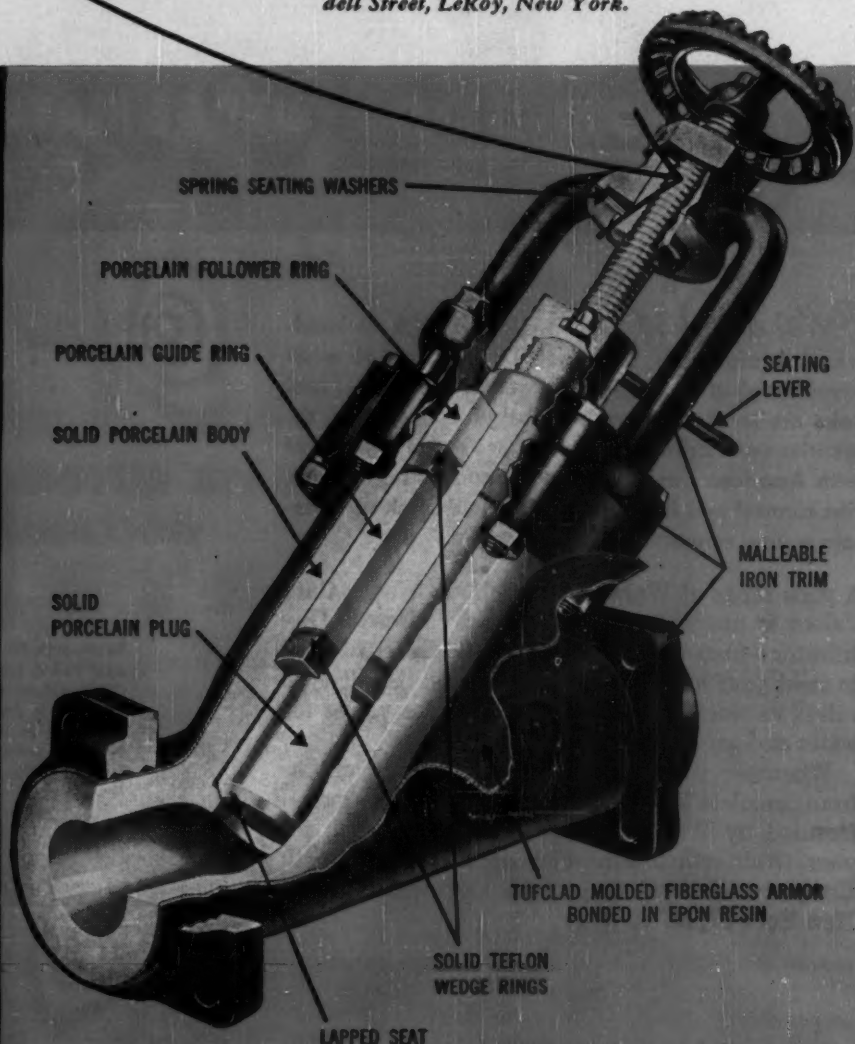


Yoke valves, angle valves, flush valves, safety valves, and plug cocks of Lapp Porcelain have standard bolt-circle flanges for easy connection to all piping and equipment.

Lapp

**PROCESS
EQUIPMENT**

Chemical Porcelain Valves
Pipe • Raschig Rings • Pulsafeeder
Chemical Proportioning Pumps



Pace-Setting HD-5G Tractor Shovel

NOW BETTER 3 WAYS

FOR EFFICIENT MATERIAL HANDLING



HD-5G TRACTOR SHOVEL

Rated capacity	1 1/4 cu yd
Belt horsepower	50
Weight, complete	16,200 lb
Dumping height	9 ft, 2 in.

From the time of its introduction seven years ago, the Allis-Chalmers HD-5G Tractor Shovel has been tops in popularity. Many thousands are daily proving their ability and versatility on all kinds of material handling and excavating jobs.

Now, design refinements make the HD-5G a three-way better value than ever before:

1. Has Bigger Rated Capacity

New bucket handles a big 1 1/4-yd load — streamlined design now helps roll in large loads with less tractor effort. The back of the bucket has been brought forward and the sides extended to cut spillage, put more payload where it's wanted.

2. Helps the Operator Do More

Cleaner dumping with the new bucket saves the operator time and effort shaking out loads.

For added versatility, there is a two-position bucket available with both standard automatic return to digging position and operator-controlled tip-back. If the operator chooses to use the controlled tip-back, he can load the bucket, then tip it back approximately 25° before raising, assuring maximum output under special conditions such as downhill loading or loading loose materials.

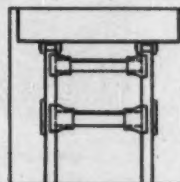


The HD-5G helps the operator do more in other ways, too — giving him full vision, fast and easy control, cleaner platform and more comfortable seat from

which to work, and more working time with truck wheels, support rollers and idlers that need greasing only once every 1,000 hours.

3. Works at Lower Cost

The HD-5G now works at even lower cost than ever before — not just because it *does more*, but because it has features that mean *less maintenance, longer life*. For instance, new type tubular bracing on the bucket booms provides added strength and support, keeps the bucket in line. The floor at the rear of the new bucket has been raised seven degrees to reduce wear on the bottom sheet. Heavy-duty truck wheels and idlers are available for particularly tough working conditions. One-piece, full-length main frame permits unit construction so that major assemblies can be removed without disturbing adjacent units, putting tractor back on the job in hours rather than days.



Ten Quick-Change Attachments Add to HD-5G Versatility

Bulldozer	Crane Hook	Tine Fork
Angledozer	Light Material Bucket	Rock Fork
Narrow Bucket	Trench Hoe	— also rear-mounted Ripper
Rock Bucket	Lift Fork	

See your Allis-Chalmers dealer for more about these and other production-boosting features of the popular HD-5G Tractor Shovel.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



A "NEW HIGH..."

FOR

Limitorque®

motorized, push-button Valve Operation

This illustration shows a unique application of LimiTorque on one of six 24" gate valves supplied by Crane Company to Kaiser Engineers, Hanford, Washington. The extension spool permits the LimiTorque Electric Valve Operator to be located on a floor lever 15 feet above the center-line of the Valve. This is just one of the many unusual and effective applications of LimiTorque on Land and Sea.

Wherever convenient automatic valve operation is desired, or where an emergency may demand rapid, safe and positive remote operation — LimiTorque is the answer.

LimiTorque operates at the mere "push of a button" and thus, saves time, labor, and money required for manual operation of valves at distant or inaccessible locations. Further, LimiTorque opens and closes valves at the exact speed required, and it also "limits the torque" applied to valve operating parts, thereby preventing possible damage to valve stems, seats and discs. And too, the handwheel "cannot rotate" when the valve is being motor operated.

LimiTorque may be actuated by any available power source, such as Electricity, Oil, Gas, Water or Air; and is now available for Microwave control.

Send for new Catalog L-54.



PHILADELPHIA GEAR WORKS, INC.

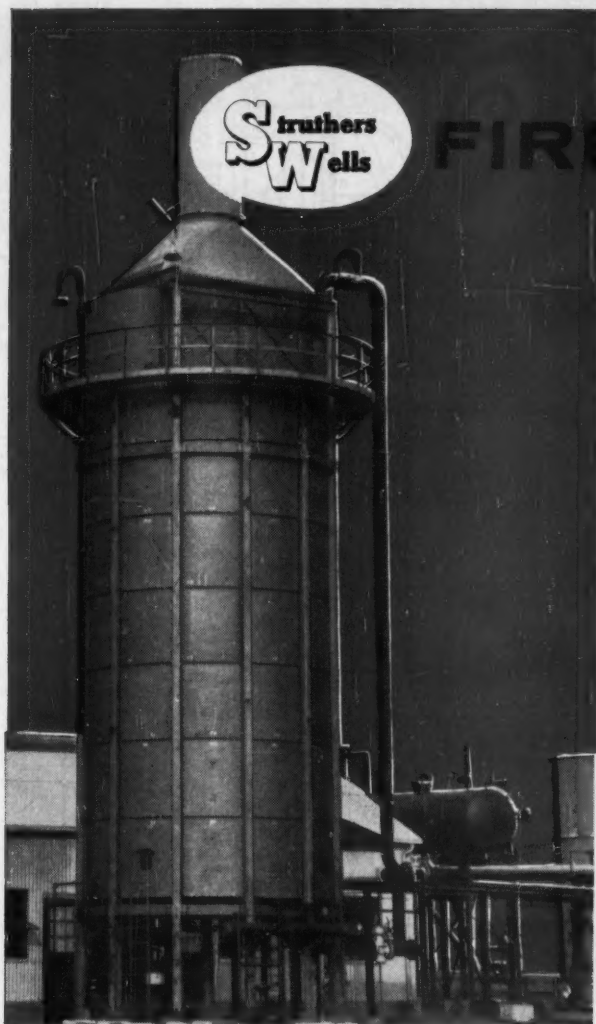
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
LimiTorque Corporation-Phila.



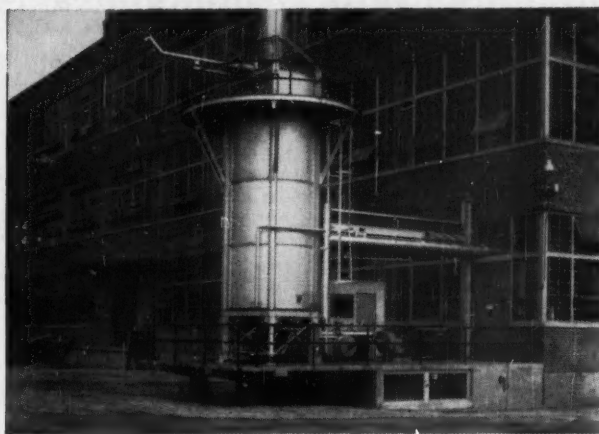
Industrial Gears & Speed Reducers

LimiTorque Valve Controls

Established 1892



A Struthers Wells Type CV absorption oil heater installed at a gasoline plant of one of the largest gas transmission companies, the third installation for this company.



A fired heater for Struthers Wells Dowtherm heating system, one of two units installed in a new chemical plant for the production of vat dyes.

FIRED HEATERS

FOR

PETROLEUM REFINING

GASOLINE PLANTS

CHEMICAL PLANTS

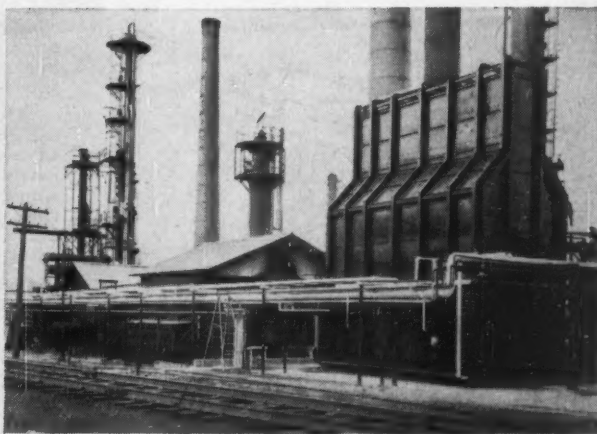
GENERAL INDUSTRIAL USE

Available in standard sizes from 500,000
to 40,000,000 BTU per hour

Hundreds of Struthers Wells fired heaters are now in service, in a wide range of sizes, for direct heating of petroleum oil, hydrocarbon gases, asphalt, air, oxygen, hydrogen and superheating steam, and for indirect heating using circulating heat transfer mediums. Circulating fluids used include molten metal, molten salt, Dowtherm, mineral oil, and a number of other organic materials.

In connection with heating systems, we can supply all equipment items, as a complete unit, including wired and piped panel control boards.

We also supply electrically heated units—and special heating and cooling equipment, including water heaters.



Shown above are two Struthers Wells heaters in petroleum refinery service. At right is a three-coil heater used in catalytic reforming of gasoline. At left is a heater which was installed over 23 years ago, and is still in continuous service.

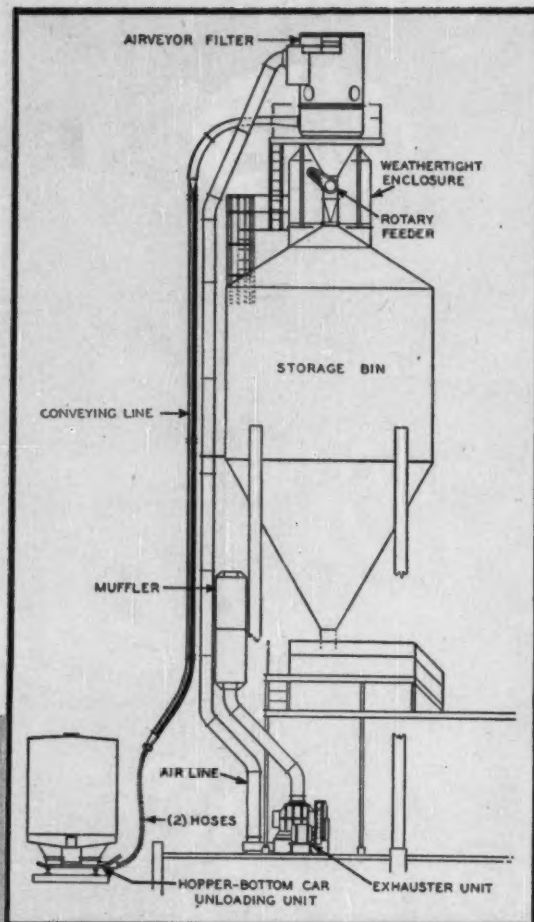
STRUTHERS WELLS CORPORATION

WARREN, PA.

PLANTS AT WARREN, PA. AND TITUSVILLE, PA.

Offices in Principal Cities





AGAIN . . .

Mead Corporation installs *AIRVEYOR*.

Flowing mill-supply chemicals, such as lime, soda ash, salt cake, starch and clays with the Airveyor—unloading cars to storage or in-plant conveying—is the simplest, most economical conveyor for your plant.

Mead Corporation has learned from experience that it pays to use the Airveyor, having continued to install such equipment wherever possible and practical, until today in four of its plants, nine such systems are in use. One of the most recent installations is that for unloading lime from cars to storage, at rate of 15 tons an hour, in the Chillicothe, Ohio plant, shown by photograph and drawing above.

The paper industry has learned by experience that the Airveyor is engineered and built for superior performance . . . well over a hundred systems have been installed in various mills in the United States and Canada.

If you have a problem in your handling of mill-supply chemicals, why not let us make a study of your layout . . . chances are we may be able to show you a more efficient and profitable method of operation . . . such a study costs you nothing, obligates you in no way.

Fuller
CONVEYS BY
AIR
... NOTHING MOVES
BUT THE MATERIAL

FULLER COMPANY—CATASAUQUA, PA.

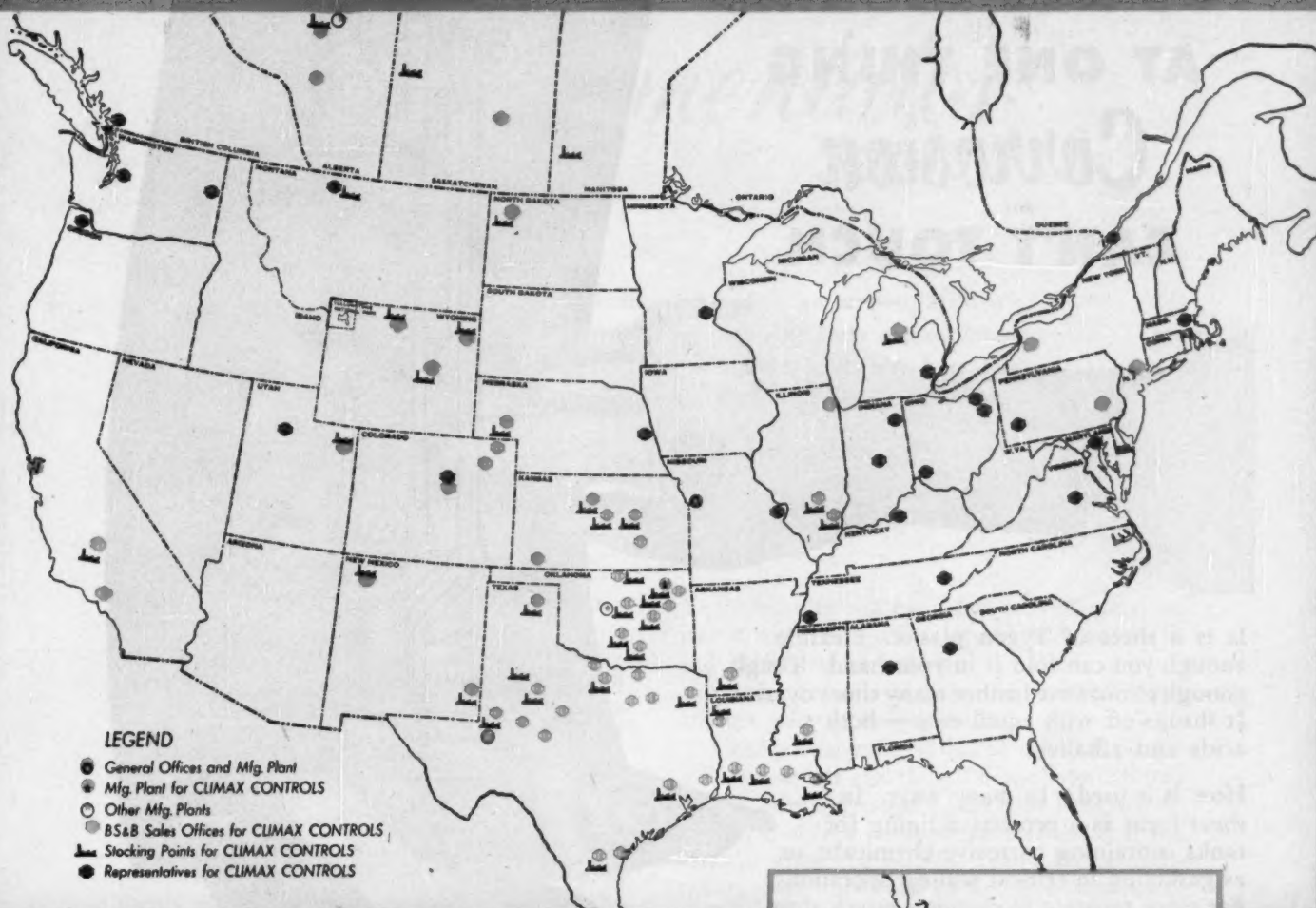
Chicago • San Francisco • Los Angeles • Seattle • Birmingham

**DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—
COMPRESSORS AND VACUUM PUMPS—**

FEEDERS AND ASSOCIATED EQUIPMENT

A-100
2326

121 BS&B CLIMAX CONTROLS CENTERS...



...Serving Industry In The Americas!

For Your Convenience

No matter where you are located in the United States, Canada or the Latin American countries . . . these BS&B Climax Controls sales and service centers are prepared to give you fast, efficient and convenient service on the finest in automatic controls for the regulation of pressures, temperatures, liquid levels and flow. From these centers, including 40 strategically located warehouse stocks of Climax Controls and parts, Climax sales engineers are quickly available to render service on existing equipment or to help you plan new installations. For additional information or a Climax Controls catalog, contact your nearest Climax Controls Center, or write to . . .

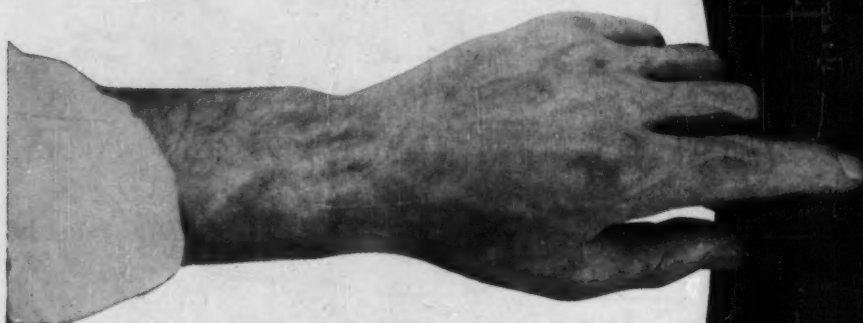


BLACK, SIVALLS & BRYSON, INC.



Climax Controls Division, Dept. 4-N2
7500 East 12th Street
Kansas City 26, Missouri

YOU ARE LOOKING AT ONE THING *Corrosion* CAN'T TOUCH



It is a sheet of Tygon plastic. Flexible enough you can fold it in your hand. Tough enough to outwear leather many times over. It shrugs off with equal ease — both acids and alkalis.

How is it used? In many ways. In sheet form as a protective lining for tanks containing corrosive chemicals; or as gasketing in critical sealing operations. Far more resistant to chemical attack than rubber, far easier to install, Tygon possesses the unusual property of being neutral, neither affecting nor affected by the vast majority of industrial chemicals.

As tubing — in bores ranging from .120" to 2" — Tygon pipes acids, alkalis, pharmaceuticals, beverages, milk, liquid foods, blood plasma — highly critical and sensitive solutions — in perfect safety. Glass clear, flexible as a piece of string, Tygon Tubing is the standard of research laboratories the world over.

As a liquid Tygon serves both as a paint and as a dip coating. Applied by brush or spray, it protects metals and concrete from attack by acid fumes.

Tygon molds as readily as rubber, and in this form extends its protective qualities over an almost unlimited range of intricate shapes.

If corrosion is a problem to you — Tygon may prove the perfect answer.



WRITE FOR THIS FREE TYGON PORTFOLIO

Detailed technical data on the use of Tygon in its various forms, arranged in a convenient reference binder.

Address: The U. S. Stoneware Company
Plastics and Synthetics Division
Dept. CE 255
Akron 9, Ohio

Ask for the TYGON PORTFOLIO.



Plastics and Synthetics Division

FEBRUARY
1955

Chementator

Edward T. Thompson

● With its \$15 million Salamanca-lube plant on stream, Mexico's government plans to halt all lubricant imports. Only sop to dozen U. S. oil firms affected is that they will be able to buy base oils from Mexico to process and sell under their own brand names.

● Commercial production of mono-, di- and triethanol amines has started at the Orange, Tex., plant of Allied's Nitrogen Division.

Novel switch: make H₂S from sulfur

Though it's common practice to make sulfur from hydrogen sulfide, news that Sherritt Gordon Mines, Ltd., had installed a unit to do just the reverse came as quite a surprise. But it's a perfectly logical move under the circumstances.

The new leaching process being used at the company's new nickel refinery at Fort Saskatchewan, Alta., requires up to 3,000 lb. of H₂S daily to precipitate byproduct copper and cobalt. And there's just no H₂S readily available in the area. So Sherritt had the Girdler Co. (Louisville) design and build a generating unit that could make it from sulfur and hydrogen, which can be had.

Basically, the Girdler process is a direct gas phase reaction between hydrogen and sulfur vapor (above liquid sulfur). It occurs at elevated temperature and pressure. The resulting mixture of H₂S and sulfur vapor is cooled to condense out sulfur, then passed through water-cooled condensers to freeze out the last traces of sulfur.

The unit is running smoothly. And with this experience behind them, Girdler now expects to find other applications for its hydrogen sulfide generating units.

Acetylene-PVC plant causes furor

Makers of vinyl chloride monomer and polymer were taken aback last month when Simpson Coal and Chemical, a subsidiary of Standard Ore and Alloy Corp. (New York), announced it would build a \$20 million plant at Natchez, Miss.

Yearly capacity will be 30,000 tons of acetylene, part of which will go into vinyl chloride and PVC, and 30,000 tons of ammonia.

And from all over came the question: What are they going to do with it all?

The general feeling is that though vinyl plastics will show steady growth in the near future, there's already plenty of capacity. Simpson has given no indication of how much of this commodity it will make or where it'll be sold. Nor is the company talking about markets for its acetylene or ammonia, both of which will be in good supply in the area when this plant goes on stream early next year.

But there seems to be no reason to doubt that the plant will be built. A site on the Mississippi River next to an International Paper Co. plant has been bought, and natural gas supply is assured. Completion is scheduled for the second quarter of next year.

Adsorption done by fluidized solids method

Just itching for a commercial tryout is a new Standard Oil Development adsorption process that uses fluidized solids techniques. Called Fluidized Char Adsorption, it boasts high gas separation efficiencies (95-100% for light hydrocarbons), high allowable gas and solid velocities, and small heat transfer surface needs.

Likely applications, predicted SOD scientists at a recent A.I.Ch.E. meeting, are hydrogen purification, acetylene concentration, solvent vapor recovery, and separation and recovery of C₁, C₂ and

CHEMENTATOR . . .

C₃ fractions from refinery fuel and waste gas streams.

Though the work so far has been pilot plant, it indicates a good competitive position for the FCA process.

Unlike fluid cracking in which gas and solids mix completely in one chamber, FCA requires staging. The adsorption section looks much like a bubble cap tower, with downcomers and trays of bubble caps (modified in design). Gas feed enters near the middle, fluidized char at the top, and contact occurs as the beds of char move slowly across the trays and down the tower.

Following adsorption, the char enters a desorber where it's heated by condensing Dowtherm vapors and contacted with steam to drive off hydrocarbons. Part of these hydrocarbons are returned to the bottom of the adsorber and part withdrawn as product. The final steps are dehydrating the char, cooling it, and returning it to the adsorber.

Char can be reactivated if necessary by contacting it with steam at 1,000-1,500 F. But SOD believes this won't be necessary if the feed is limited to materials no heavier than C₅ and no unsaturates other than ethylene, propylene and acetylene.

In fact, the process is ready for commercial application right now with these feed limitations. And Stone & Webster has been authorized to negotiate non-exclusive licenses for FCA.

Process update brightens oil sands picture

Enough test data have been accumulated on a new way to extract petroleum from Athabasca oil sands to design full-scale plants (see *Cementator*, Nov. 1954, p. 106). Using centrifugals, Can-Amara Oil Sands Development (Calgary) says its technique is so superior to any previously tried that broad development of the sands can be done for less than 35% of earlier cost estimates.

The process entails diluting oil sand with light oil to lower specific gravity, then feeding the mixture to the separators. There's a constant layer of water and chemicals (to improve wetting) through which oil sand and diluent are thrown centrifugally. This causes oil, sand and clays to separate by densities.

Chief advantage of this method is that the separator removes sand, fine clays and water, giving, for the first time, emulsion-free oil. The oil produced is better than 25 API gravity and recovery efficiency is 98%.

More tests will be run this spring on the pilot model designed by De Laval Separator Co. But

already Can-Amara estimates that future full-scale development will cost \$35-50 million. This includes all plant, mining and separating equipment, plus a 300-mile, 10½-in. pipeline to carry crude from the site at Bitumont, Alta., to Edmonton.

Fatty alcohols by direct hydrogenation

Combining direct hydrogen-fatty acid reaction with a continuous catalyst system, Rust Engineering of Pittsburgh is now offering American industry a new route to fatty alcohols. Developed by Societe D'Innovations Chimique (Sinnova) over 10 years ago, it's been well-proved in France.

All steps are continuous. Fatty acids (from tallow or vegetable oils), hydrogen and a nickel-chrome catalyst are fed into a high pressure, tower-type reactor. Reaction products are separated and crude fatty alcohols fractionated to any desired specifications. Catalyst is recovered and recirculated.

Highest quality product is assured by Rust, together with minimum cost. In France very fine cuts are made, particularly from coconut and other vegetable oils. But in this country it appears likely that demand will be for wide-range cuts. And Rust expects that some of these can be made by simple clean-up methods (e.g., filtration), with little or no fractionation.

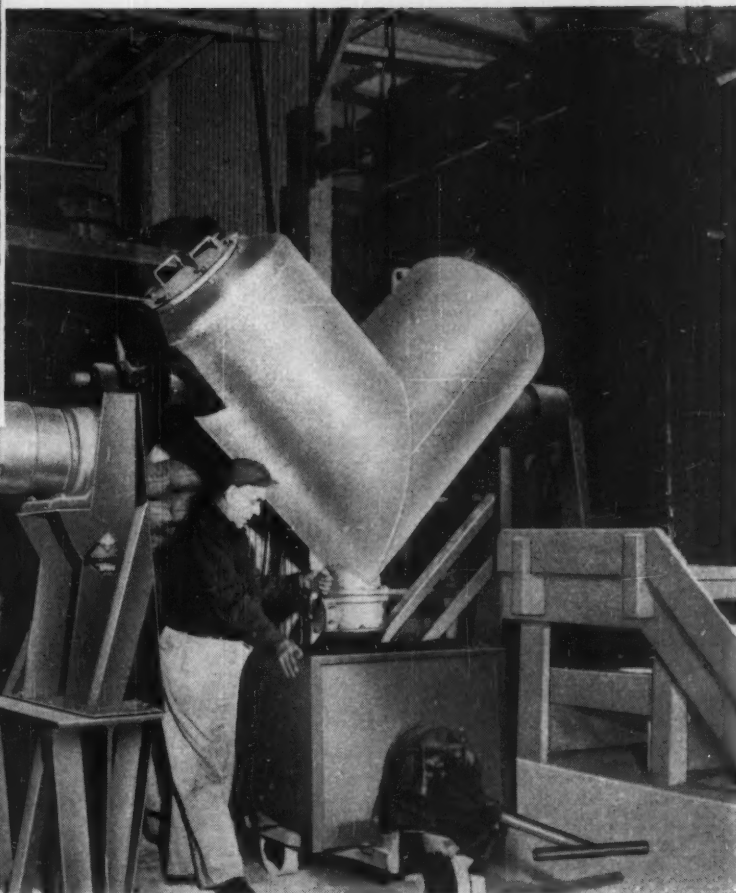
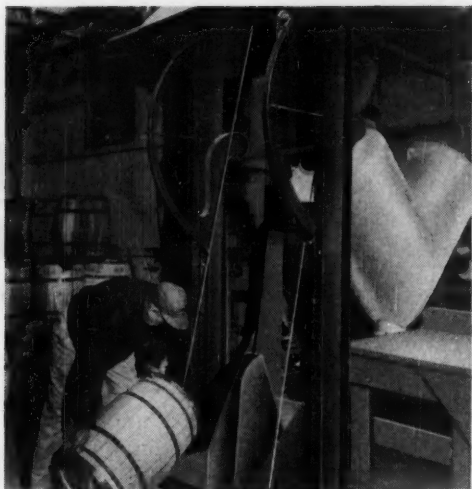
The Sinnova process is the second foreign fatty alcohol process to be introduced into the U. S. in recent months. Last year (*Cementator*, Aug. 1954, p. 103), Blaw Knox offered the Belgian SBA method—also a high pressure operation. Major processing differences between the two are that SBA esterifies the fatty acids with methanol before hydrogenating and uses a fixed bed reactor. This, of course, requires methanol recovery.

New process yields manganese from poor ores

Little heralded, a Bureau of Mines process for making metallurgical-grade manganese from low-grade ores is about ready for commercial scale-up. Though not quite competitive on its present pilot plant scale, improvements during scale-up are fully expected to make the process extremely significant to the commercial manganese market.

The technique, known as the dithionate process, leaches any manganese dioxide type ore with sulfur dioxide, forming manganese sulfate and manganese dithionate. The manganese is removed by precipitating it as hydrated hydroxide with lime.

(Continued on page 108)



Loading and unloading a blender can be easy when it's correctly designed. Above, a worker at Precision Grinding Wheel Co., uses a skip hoist to load a **p-k** twin shell blender of 20 cu. ft. capacity. At right, after mixing, he opens a valve to discharge the perfectly blended mass into a mobile hopper. The smooth interior of **p-k** blenders are entirely free of obstructions to allow easy discharge and cleaning.

Precision Blending **3 TIMES FASTER**

Another cost-conscious manufacturer cuts operating and maintenance expense by mixing abrasives in a **p-k** twin shell blender

A thorough, uniform blend of abrasive grains is essential if the grinding wheels are to perform properly. That's why mixing those particles formerly took 15 minutes per batch in a conventional mixer.

Today, with a new **p-k** twin shell blender, that time has been cut from 15 minutes to 5, and an even more uniform blend results.

But that's not all. Precision Grinding Wheel Co., Inc., Philadelphia, reports wear and tear drastically reduced, too. Where critical parts of other mixers were always wearing out, the **p-k** twin shell just keeps rollin' along. The answer is in **p-k**'s gentler, rolling-folding action which keeps abrasion

of the grains to a minimum, while retaining grain cutting effectiveness and size. Easier charging and discharging, too . . . and hardly ever any cleaning. Taken all-in-all, this **p-k** user has found that . . .

As in plant after plant, the **p-k** twin shell blender does the job better, faster, and lasts longer. And that's natural, for **p-k** has been pioneering new design in all three basic blenders.

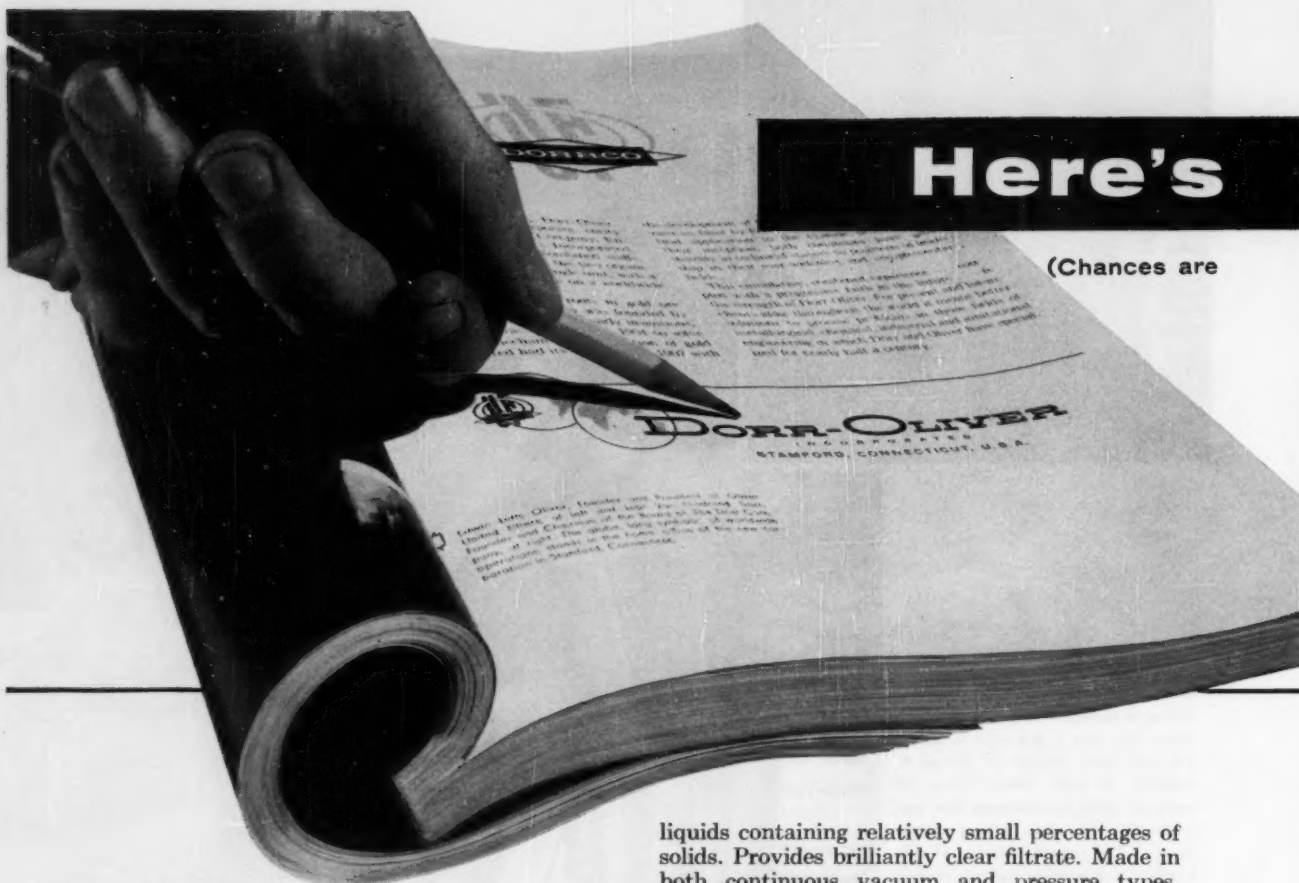
Let us make some free blending tests on your material, and report the results . . . Chances are we can save some money for you, too. For complete information write for **p-k** catalog #13.



The Patterson-Kelley Co., Inc.

120 Lackawanna Ave., East Stroudsburg, Penna.

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.



Here's

(Chances are

► CLASSIFICATION

The Dorr Classifier . . . first machine to put classification on a continuous, mechanical basis and still the standard unit for wet separations in the 28 to 200 mesh range. Now available with Type H mechanisms in a complete range of sizes.

The Dorr Bowl Classifier . . . incorporates standard machine with shallow, circular bowl for separations in 65 to 325 mesh range.

The Dorr Hydroseparator . . . for large volume flow or exceptionally fine separations.

The Dorco Jet Sizer . . . multiple-spigot, hindered-settling classifier featuring low operating cost and extreme flexibility of cell arrangement.

DorrClone* and Centriclone* Classifiers . . . a complete range of wet cyclones in diameters from 10mm to 24 in. . . both single and multiple unit installations.

► FILTRATION

The Oliver Filter . . . first machine to put vacuum filtration on a continuous basis and still the standard rotary drum filter of the process industries. Can be built of any base metal and rubber covered to meet practically any corrosion problem. Available in sizes ranging from 3 to 790 sq. ft. of filtering area and with a variety of discharge methods depending on cake characteristics. Can be hooded when handling toxic or inflammable material.

The Oliver Precoat Filter . . . for clarifying

liquids containing relatively small percentages of solids. Provides brilliantly clear filtrate. Made in both continuous vacuum and pressure types, open, hooded or vapor-tight construction.

The Oliver Topfeed Filter . . . for dewatering and drying relatively coarse, rapid settling or crystalline materials. Produces virtually bone dry product ready for packaging or storage.

The American* Filter . . . ideal for dewatering slurries which form relatively thick cakes. Features big savings in floor space and can be compartmented to filter two or more products on the same machine.

The Dorco Filter . . . low maintenance unit where filtering takes place on the inside of the drum which also acts as the filter tank. Especially suited for dewatering fast-settling solids.

The Oliver Horizontal Filter . . . capable of counter-current washing in a single unit. Ideal for relatively slime-free slurries which form thick cakes.

The Sweetland* Filter . . . a quick opening batch pressure filter with individual sight glass on each leaf. Good for leaching operations and where % solids in feed is insufficient to form a dischargeable cake on a continuous unit.

The Kelly* Filter . . . a high pressure batch filter which is readily jacketed for handling molten sulfur and other elevated or sub-normal temperature slurries.

► THICKENING

Dorr Thickeners . . . center shaft, center pier and traction units in a wide range of types and sizes to handle every thickening or clarification

Our New Name

you saw it in this ad last month)

and Here's the Complete Line of Dorr-Oliver Equipment for the Chemical Process Industries...

problem. Individual units available to handle from one to 25,000 tons of solids in feed per day. Can be arranged in trays for counter-current washing, parallel thickening or a combination of both in a single unit.

► ROASTING & CALCINATION

Dorrco FluoSolids* Systems . . . the most significant advance in roasting techniques in the last 30 years. For roasting sulfides for metal recovery, for SO₂ production for acid manufacture, for roasting gold ores prior to cyanidation, for heat treatment steps in the concentration of various ores. Also for simultaneous sizing and drying in the 28 to 150 mesh range.

► LIME SLAKING

The Dorrco Slaker . . . a two-compartment unit for producing grit-free milk of lime. Sizes to slake from ½ to 8 tons of CaO per hour.

► WATER AND WASTE TREATMENT

A complete line of proven equipment for the purification of industrial water supplies and liquid industrial wastes.

► ION-EXCHANGE

Dorrco d-i* Systems . . . for selective or complete removal of ionizable salts from water or solutions bearing sugar, chemical or metallic compounds.

The Dorrco Hydro-Softener . . . a new unit for softening water supplies continuously by base exchange.

► PUMPING

The Oliver Type L Pump . . . a corrosion resisting centrifugal pump with extremely high efficiency. Primes easily and holds prime better due to self-venting feature.

The Olivite* Pump . . . an efficient, rubber-covered centrifugal pump which is highly resistant to nearly all corrosive solutions, hot as well as cold.

Dorrco V-Type and W-Type Pumps . . . for positive, controlled removal of settled solids from thickeners and hydroseparators. Can be used as meters ahead of further treatment.

The ODS Diaphragm Slurry Pump . . . variable volume pump from zero on up. Discharge can be shut off while pump is running. Operates on compressed air with no mechanical linkage.

► **FOR FURTHER INFORMATION** . . . The foregoing serves only to highlight the scope of Dorr-Oliver. We'll be glad to send you literature providing detailed information on our world-wide equipment and services for the chemical process industries. Dorr-Oliver Incorporated, Stamford, Connecticut.

*Trademark Reg. U.S. Pat. Off.



DORR-OLIVER
INCORPORATED

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

CHEMENTATOR . . .

This can then be easily sintered to a mixture of lower oxides (such as Mn_2O_3 and Mn_3O_4).

Gas is run into leaching tanks so designed that the impeller has an inspiring effect on the gas and at the same time brings the gas into intimate contact with ore particles. Reaction is rapid and ore goes into solution almost at once.

As manganese sulfate forms it reacts with calcium dithionate to form manganese dithionate. Simultaneously sulfate is removed as insoluble calcium sulfate. Thus you get high-grade precipitate when lime is added without calcium sulfate contamination. The lime also regenerates calcium dithionate for use in pulping the ore prior to leaching.

Earlier European attempts to use this type of leach required considerable excess SO_2 to attain a high enough reaction rate. The Bureau, with countercurrent flow, utilizes practically all the SO_2 and has no such problem.

Pilot plant runs at Boulder City, Nev., were on an Arizona ore containing only 9.6% manganese. Using 12% SO_2 (2 lb. per lb. of manganese extracted), 90% of the manganese is recovered, giving a product containing 60% manganese. Biggest impurity is gypsum (5% max.); others are insignificant amounts of trace elements.

Full details of this process probably won't be available before spring. Though the pilot work, under the direction of Harry Fuller, is completed, it will take that long to write the report. But should the process really go commercial it will mean that the U. S. need no longer rely on foreign ore deposits for supply of this vital material.

New draft cuts ease manpower squeeze

Starting this month draft calls will be cut from 23,000 a month to 11,000. It's all part of a new schedule of manpower reductions ordered by President Eisenhower to tailor the Armed Forces to fit defense designs drawn up by the Joint Chiefs of Staff.

Importantly, the new cut is expected to reverse present trends in occupational deferments—now dropping at the rate of 900 per month. Current troubles in getting and keeping such deferments have cast a dark shadow over company plans for recruiting fresh-from-college chemical engineers. This month's drastic slice in inductions considerably brightens hopes of filling industry's engineering quotas.

Still, the new move is only a stopgap. The present draft law is due to expire in June. And it's expected to be replaced by one that will spread

trained manpower more equitably between military and civilian needs—probably by adopting a form of universal military training and selectively recallable reserves.

Unique ammonia-urea plants start up

Looking almost like twins, processwise, two major ammonia-urea plants recently started operations in the South. They're the first to combine Texaco partial oxidation with Casale ammonia synthesis and the Pechiney urea process.

First in was the \$18 million Pryor, Okla., plant of John Deere & Co. Capacity of this one is 180 tons a day of urea and 260 tons daily of prilled urea. Right on its heels came Grace Chemical's \$20 million installation at Memphis, Tenn., with a rated potential of 250 tons of ammonia and 150 tons of urea.

Actually none of the three major processes involved is being used for the first time, though this is the first American attempt at Pechiney urea synthesis. But all the steps are quite new, at least to U. S. industry.

Texaco partial oxidation, first used by Spencer Chemical at Vicksburg in 1954, is considered by many to be the most efficient and versatile process for making ammonia synthesis gas. It uses no catalyst, and, because the gas emerges at about 350 psi., big savings in compression are attained.

Most important feature of Casale ammonia synthesis is that it's the only process that recirculates unconverted gases by an ejector system rather than a compressor. It does require high pressure (over 9,000 psi.), but this is justified by higher once-through conversions and by elimination of refrigeration usually needed to condense the ammonia. A well-known process in Europe, Casale synthesis was first used here by Pennsylvania Salt last year.

Total recycle is the key to Pechiney urea. It's accomplished by fine dispersion of the ammonium carbamate in a matrix of neutral oil. Foster Wheeler Corp., which built both plants, says power consumption is much lower with Pechiney than with any other total recycle method.

Solvent rival for DMF, maybe others

Commercialization of a 100-year-old laboratory curiosity—dimethyl sulfoxide—may bring a new, though high-priced competitor into the solvents market. Stepan Chemical (Chicago) is considering

(Continued on page 110)

When You Buy From
GENERAL CHEMICAL
You Always Get
MURIATIC ACID

The way you want it—

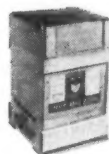
In all grades and strengths from Standard to C.P. (Reagent) quality: Standard grade—18°, 20°, and 22° Baume; Diamond and Crystal grades—20° Baume; Reagent grade—Specific Gravity 1.18.

When you want it—

Shipped swiftly from stock points in major industrial centers across the country.

As you want it—

In tank cars, tank trucks, or carboys. For Muriatic Acid— as you want it—where you want it— just 'phone or write our nearest office listed below.



GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo • Charlotte • Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) • Houston • Jacksonville • Kalamazoo • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Providence • San Francisco • Seattle • St. Louis • Yakima (Wash.) • In Wisconsin: General Chemical Company, Inc., Milwaukee

In Canada: The Nichols Chemical Company, Ltd. • Montreal • Toronto • Vancouver

Basic Chemicals
for American Industry

building a 10-million-lb.-per-yr. plant to make DMSO, hopes to cut into the dimethyl formamide market by keeping the price to 25¢ a lb.

Large-volume uses suggested for DMSO are as a solvent for synthetic fibers (as effective for Orlon as DMF, it's claimed), solvent for acetylene, oil and fatty acid purification and antifreeze. But acceptance is going to depend largely on price. At 25¢ it isn't much of a rival for solvents like acetone. However, Stepan figures that if demand can be built up to allow expansion to 100 million lb. a year, it's entirely possible that a 10-15¢ price can be reached—putting it in the acetone, ethylene glycol range.

Besides the possibility of boosting production, price might be lowered by technological improvements in the process. Now it works like this:

Methanol and hydrogen sulfide are catalytically reacted at atmospheric pressure and about 500 F. to form dimethyl sulfide. This is condensed, then purified by distilling off methyl mercaptan (which might be sold to methionine makers) and excess H_2S and methanol for recycle.

Purified dimethyl sulfide is mixed with air and NO_2 (catalyst) in a series of reactors at 120 F. to form DMSO. The gas mixture rises and as DMSO forms it condenses, runs down the walls and is collected. Nitric oxide in the exit gases is recovered and recycled.

Collected DMSO is heated to drive off NO_2 . Final purification is by vacuum distillation, which leaves a 99.9% pure, water-white product.

Both boiling and flash points of DMSO are high—372 F. and 203 F., respectively. Other valuable properties cited by Stepan are complete solubility of many gases in DMSO (including acetylene) and excellent selective solvency with high capacity for aromatics, unsaturates and sulfur compounds and low capacity for paraffinics.

An alternate raw material source is the dimethyl sulfide output of the sulfate pulp industry. But if demand comes near Stepan's expectations, this would be inadequate and the petrochemical route would be much more logical.

Easy way to sulfur removal

To rid its natural gas of a good deal of hydrogen sulfide, Shell Oil has turned to simple water washing. A pilot plant now running near Calgary, Alta., may well be the precursor of full-scale operations this year.

Water washing has been used before on natural gas—in ammonia plants to remove carbon dioxide—but it's been a high pressure process. Shell keeps

pressure down to about 500 psi. (at 100 F.), eliminates 80-90% of the H_2S from natural gas containing 32-35% to start with. At the same time, carbon dioxide content (12% initially) is reduced by about 60%.

The pilot plant work has been on a fairly hefty scale—300,000 cu. ft. of gas a day, 50 gal. per min. of water. And though it's still too early to tell for sure, Shell hopes these experiments will show that water washing has a 25% cost advantage over ethanol amine treating.

One of the big economic factors is that it's so easy to recover absorbed H_2S from the water. All that's needed is simple flashing, no distillation, so no complicated equipment is required.

Mighty tempting rubber package submitted

Congress has in its hands a plan to sell the government's synthetic rubber plants that it will have trouble turning down. The disposal commission came up with a package that's good enough to meet just about any Congressional objection.

There's no real question that the original criteria set up by Congress have been met. But there are two points that disposal opponents may try to make a case of—price and monopoly.

They will say the government's not getting back every penny it put in for the past 12 years. But the commission can point to the fact that it set its price targets on potential plant earnings, not on such accounting figures as total unrecovered value or total cost.

Too, the plan's non-giveaway quality is strengthened by the fact that no sale was concluded with General Tire & Rubber for the Baytown, Tex., copolymer plant on one ground alone—General wouldn't offer an acceptable price.

On monopoly, there are two big targets: Shell Chemical, which took over three plants in Los Angeles (styrene, butadiene, copolymer), and Esso, which got both butyl plants it has operated for the government.

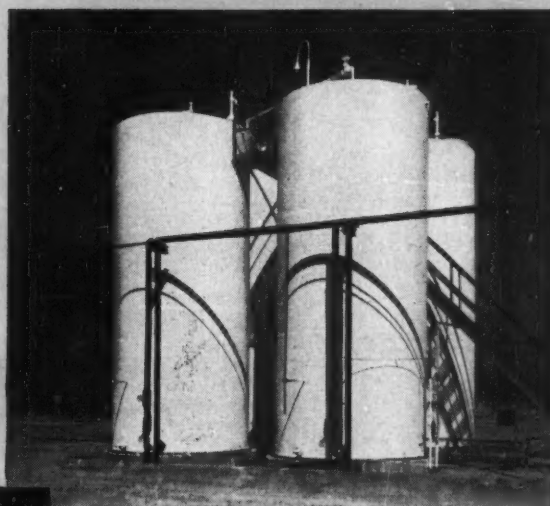
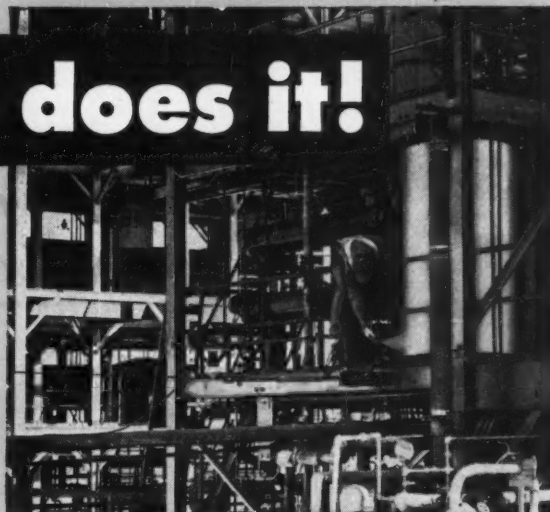
In each case, there's a big counter-argument: that oil companies don't consume rubber, hence sale to them extends competition more than if plants went to rubber users.

But generally, since the Attorney General is submitting a report to Congress on the anti-trust aspects of disposal, critics who go much further probably won't have much success in influencing fellow legislators. There seems to be little doubt that Congress will okay the sale.

For more of WHAT'S HAPPENING . . . 112

EPON[®] RESIN does it!

**New paint
lasts years
...resists
corrosive spillage
at
Diamond Alkali
plant**



HERE'S HOW...

PAINT LEADS a hard life at the Diamond Alkali Company agricultural chemicals plant in Houston, Texas . . . and no ordinary paint can survive there for long!

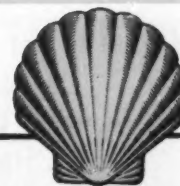
A few reasons for paint failure: Processing vessels and storage tanks are subjected to spillage of chlorinated hydrocarbons and benzene, and some also to heat. In parts of the plant, painted surfaces are exposed to the highly corrosive fumes of hydrogen chloride and sulfuric acid.

In their search to find a tougher, longer lasting paint, Diamond Alkali maintenance men tried coatings of many types, including heavy duty maintenance finishes. Some "washed

off" immediately; some lasted 6 to 8 months. Finally, Epon resin coatings based on the XA-200 formulation were tried — and found outstandingly successful.

The Epon cold-cured paint, applied by spraying throughout the entire plant, has been in service for *more than two years with no failure*. Painting costs — for both material and labor—are a mere fraction of what they formerly were, reports Diamond Alkali.

Call on our sales offices for names of suppliers who sell Epon resin coatings for your needs. Write for the full Epon coatings story in the new brochure, "*Planning to Paint a Pyramid?*"



SHELL CHEMICAL CORPORATION

Chemical Partner of
Industry and Agriculture

380 Madison Avenue
New York 17, New York

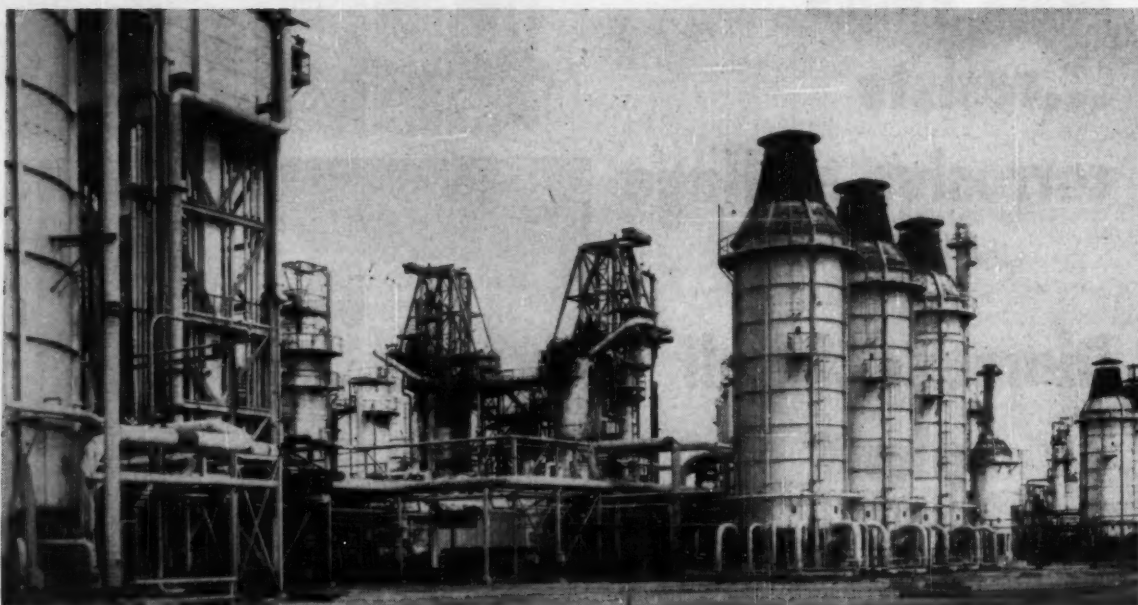
Atlanta • Boston • Chicago
Cleveland • Detroit • Houston
Los Angeles • Newark • New York
San Francisco • St. Louis

IN CANADA:

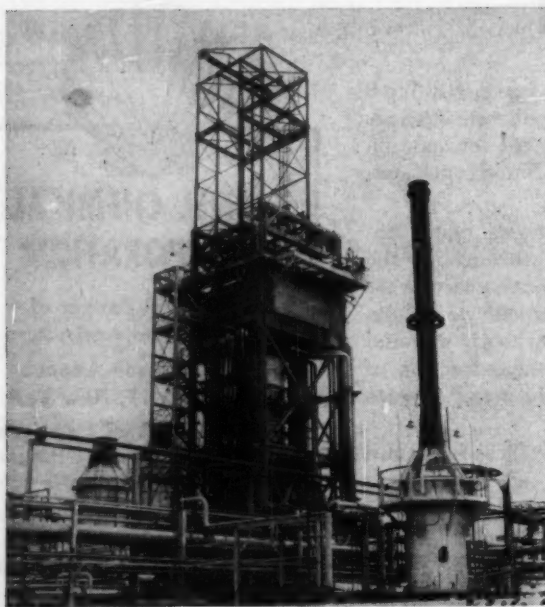
Chemical Division, Shell Oil
Company of Canada, Limited
Toronto • Montreal • Vancouver

FEBRUARY
1955

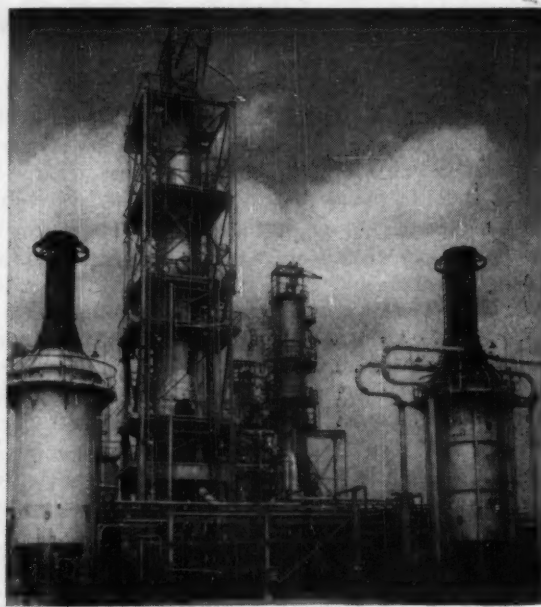
What's Happening



SYNTHESIS REACTORS (center) are in for extensive modification. Plant should be on stream by the end of the year.



GENERATOR makes synthesis gas from O_2 and natural gas.

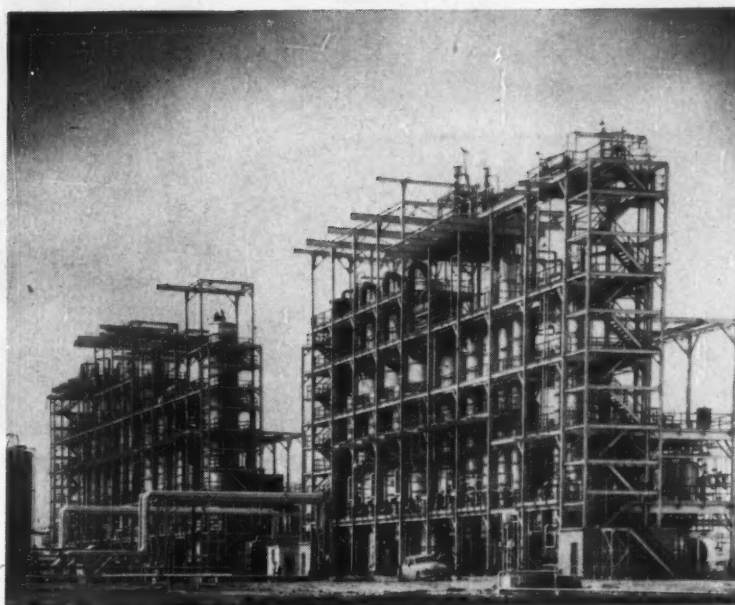


EIGHT-STORY isoformer is vital part of gas synthesis.

in Chemical Engineering

Feature News This Month

Fischer-Tropsch Revamp.....	113
No Radiation Injuries.....	114
Phenol From Cumene.....	118
Estimating Dryer Costs.....	120
New Polyethylene Plant.....	124
Newsprint From Hardwood....	126
Convention Calendar.....	128
Australian Oil Refineries.....	130
Double Absorption System....	132



CHEMICALS recovered here will be marketed by R. W. Greeff & Co., New York.

Stanolind Speeding Fischer-Tropsch Revamp

Once thought stillborn, the former Carthage Hydrocol plant is being revived, should go on stream early this fall.

With such preliminaries as new foundations and roads out of the way, Stanolind Oil and Gas Co. is now starting the vital job of breathing new life into the processing equipment of a seemingly dead plant—Carthage Hydrocol at Brownsville, Tex. Aim is to start up the gas synthesis and adjoining chemical recovery facilities before the end of this year.

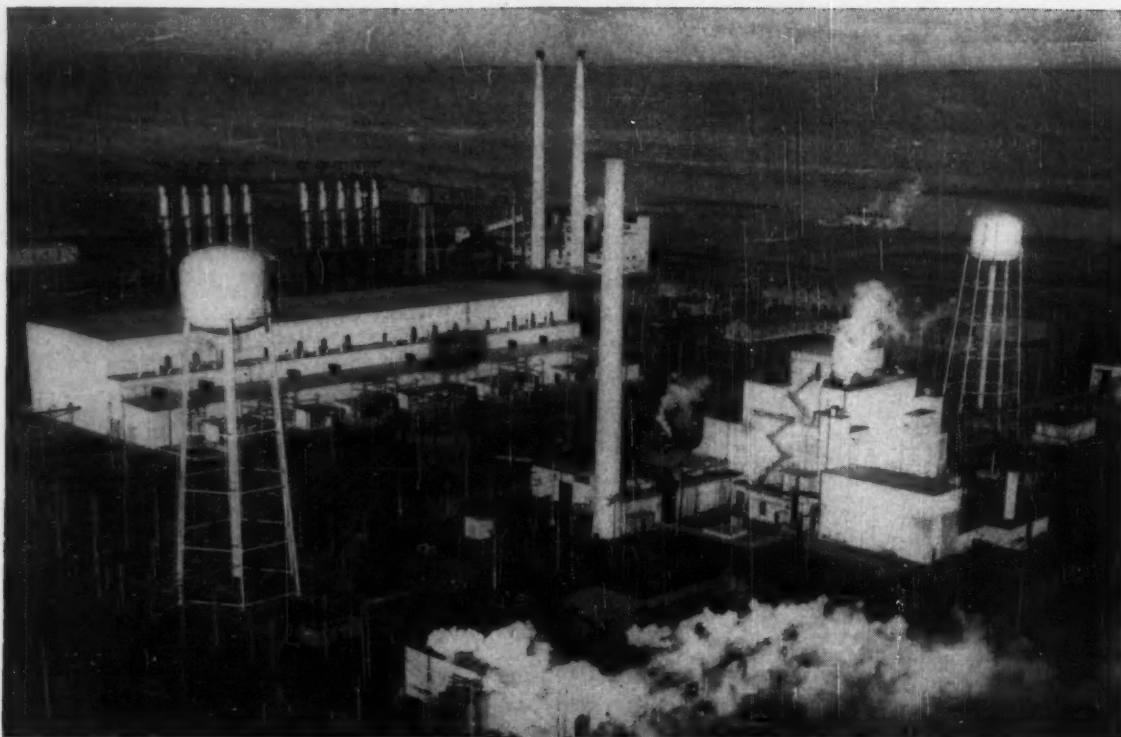
Extensive modernizations and additions are needed. Principally these include modifying the existing gas generator and building a new one, modifying synthesis re-

actors, and reinsulating the oxygen plant. Activity should hit a high next month when the Lummus Co. will have 700 men at Brownsville (in addition to 150 or more Stanolind workers).

Originally the plant was designed for Fischer-Tropsch synthesis of 90 million cu. ft. of natural gas a day into gasoline (6,000 bpd.), fuel oil, diesel oil and a variety of chemicals totaling 300,000 lb. daily. But it never really got going. And late in 1953 the nine owning firms returned it to the Reconstruction Finance Corp. chief creditor.

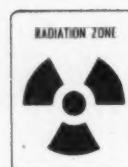
Stanolind acquired all Carthage stock and notes last March and guaranteed to repay the \$17.7 million RFC loan. When operations actually start, Stanolind will use the chemical recovery system, which it built, to separate alcohols, ketones, aldehydes and acids.

Stanolind's just as optimistic now as when it bought the plant. President E. F. Bullard said then, "We are convinced the process is sound and that the plant can be made to operate. It is simply a question of getting enough of the right equipment installed."



GE's HANFORD operations have now produced plutonium for ten years with . . .

No Radiation Injuries



THROUGH a combination of unique plant and equipment designs, painstaking personnel protection and continuous safety education, the General Electric-directed Hanford Atomic Products Operation at Richland, Wash., has operated for ten years without a single radiation-caused injury.

As a byproduct, the safety consciousness instilled in

plant personnel has helped to slice the rate of the usual in-plant injuries (non-radiation) to far below national norms.

The Hanford plant sprawls over some 640 sq. mi. and employs about 9,000 people. In the course of plutonium production, its prime operation, mammoth quantities of radioactive materials are processed. And radioactive gas,

Here Are Some Interesting Statistics¹

	At Hanford	Elsewhere
Major injuries per million man-hours exposure (5-yr. avg.)	0.65	5.33 ²
Days lost to injuries per 1,000 man-hours exposure (5-yr. avg.) . .	0.03	0.71 ²
Days lost annually due to sickness (6-yr. avg.)	3.9 (Male) 7.4 (Female)	8.0 ³ 12.0 ³
Average monthly employee separation rate (1953)	1.39%	2.17% ² 4.37% ⁴
Deaths in the community per 1,000 population (5-yr. avg.)	2.8	4.2 ⁵

¹ From speech by GE's W. D. Norwood, M. D., presented at Industrial Health Conference, Houston, Tex., Sept. 23, 1954. ² Chemical industry average. ³ National average. ⁴ All-manufacturing average. ⁵ Normal expected death rate.

LION OIL COMPANY



J. B. ROGERSON,
MANAGER OF MANUFACTURING

EL DORADO, ARKANSAS

October 29, 1954

MANUFACTURING
DIVISION

LUMMUS

NOV. 1, 1954

C.A.B.

DATE REC'D:

ROUTE TO:

REMARKS:

Mr. C. A. Barrere
Vice President
The Lummus Company
2707 Wesleyan
Houston 6, Texas

Dear Mr. Barrere:

The construction of our chemical plant in St. Charles Parish, Louisiana, to produce 300 tons per day of ammonia, 450 tons per day of nitric acid, and 550 tons per day of ammonium nitrate pellets was completed by your company June 1, 1954, and was well within labor cost and time allocated to this project.

Please extend our sincere compliments to all of the people in your organization who worked on this project for a job well done.

Yours very truly,

LION OIL COMPANY

J. B. Rogerson
J. B. Rogerson
Manager of Manufacturing

JBR:mpd

Illustrated: The Lion Oil Co. chemical plant constructed by Lummus in St. Charles Parish, Louisiana

Lummus has recently been awarded the contract to engineer and construct a 600-ton/day anhydrous ammonia plant for Westinghouse Electric Division, Food Machinery, and Chemical Corporation.

THE LUMMUS COMPANY, 385 MADISON AVENUE, NEW YORK 17, N. Y.

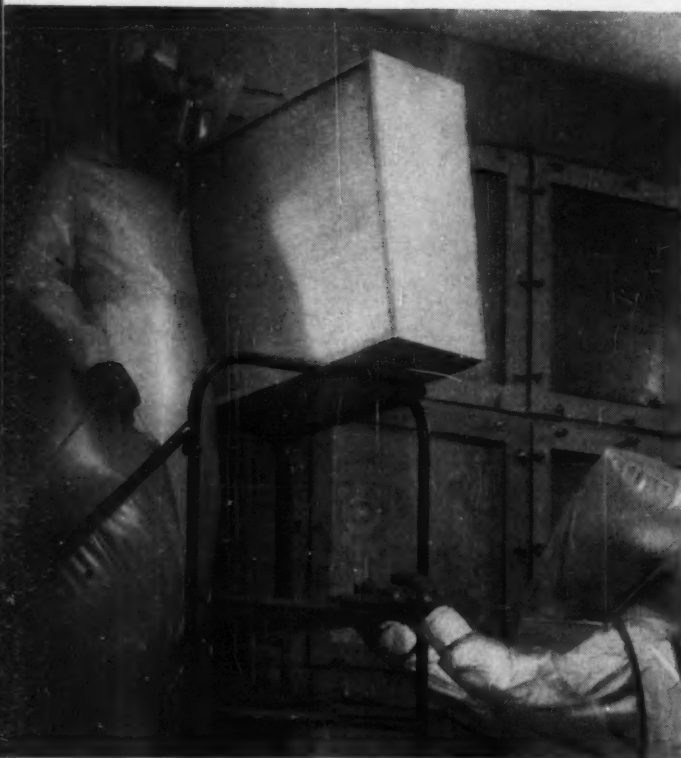
DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

WHAT'S HAPPENING . . .



Radiation Protection Is Taught . . .

Practiced and . . .



liquid and solid effluents must be carefully disposed of to prevent contamination of the surroundings.

At Hanford there is potential radiation exposure to alpha, beta and gamma particles as well as neutrons. Plutonium, the final product, requires especially careful processing because it has a long half-life, may be ingested, inhaled or absorbed through skin abrasions and is rapidly deposited in bone, where it remains indefinitely.

To protect against such hazards, Hanford relies on many safety measures. Isolating and ventilating buildings (air flow is always from less contaminated to more contaminated areas), using remotely controlled equipment and radiation shielding, continuously monitoring all sites, using holding tanks and ponds for effluents, studying the biological effects of dilute plant wastes, and even making continual weather observations are some of Hanford's defenses.

On the personal side, each Hanford employee is given a complete health evaluation, both physical and emotional, and is safety-educated by all available means, from classroom lectures to plant newspaper items. Biggest reliance, however, is placed on personalized on-the-job safety training by the supervisors and on proper protective clothing for the job. (The two men in the picture, below left, are wearing polyethylene suits while replacing a filter unit.)

The program has paid benefits in money, morale and, most important, lives.

Designed Into Equipment.





BROWN & ROOT'S *PLUS* SERVICES COMPLETE PROJECTS FASTER . . . MORE ECONOMICALLY

In every major fabrication center of the United States, BROWN & ROOT maintains highly trained experts in procurement and expediting. They know where materials and equipment are, and how to get them to a BROWN & ROOT project *fast*.

These are only a few of the services that bring BROWN & ROOT customers back again and again. Fully equipped to do a *complete* job—from selecting the proper site for any plant or project on through designing, engineering, and fin-

ished construction—BROWN & ROOT specialists “deliver the goods” *on schedule*, ready for immediate operation.

Key men in the top ranks of industrial achievement know the value of these *plus* services. That’s why the BROWN & ROOT roster of satisfied clients reads like the Who’s Who in Industry.

Why not join their distinguished company if your plans call for expansion or new construction? A BROWN & ROOT representative awaits your call, at no obligation.



BROWN & ROOT, Inc. *Engineers • Constructors*
P. O. BOX 3, HOUSTON 1, TEXAS

CABLE ADDRESS — BROWNBILT

Associate Companies:— BROWN ENGINEERING CORP. • BROWN & ROOT MARINE OPERATORS INC.

Big Capacity Boost for Chemical Nickel Plating

Industry's largest plant for chemical nickel plating has been put on stream at Dunkirk, N. Y., by American Locomotive Co. The process used, which is called Alcoplate, is based on General American Transportation Corp.'s Kanigen process—catalytic reduction of nickel with sodium hypophosphite. It includes both pre-plating and post-plating operations.

Numerous advantages are cited. Alcoplate can be used to plate any surface with uniform thickness, no matter how intricate. This is impossible with conventional electrolytic nickel plating. In addition, zero porosity is guaranteed even in plating thicknesses less than one mil; so base metal is assured of freedom from corrosion. Corrosion resistance is better than either pure or wrought nickel in nearly all applications. Other benefits are excellent adhesion (because the bond is intermolecular) and high hardness.

At Dunkirk, two systems are used. One is closed for internal and volume-coating of similar-sized products; the second is open for immersion coating. Both are continuous. And unlike electrolytic plating, where the amount of nickel deposited is controlled by the strength of the current, Alcoplate plates out at a uniform rate—from 0.6 to 1.0 mils per hr.

New School of Chemical Engineering Accredited

Add Fenn College in Cleveland, Ohio, to the list of schools with accredited programs in chemical engineering. Based on inspection and recommendation by the A. I. Ch. E. last year, the approval—by the Engineers Council for Professional Development—covers both day and evening curricula. It completes Fenn's accreditation in all its engineering programs.

Head of the department of chemical engineering (and also of chemistry) is Dr. Aaron J. Teller, associate professor, who joined the Fenn faculty in 1947.

Carbide Starts Sorbic Acid Unit

To meet an expanding demand for sorbic acid as a mold inhibitor in foods, Carbide and Carbon Chemicals Co. is building a commercial production plant at S. Charleston, W. Va. All present production comes from a pilot unit. If yields can be improved in the larger unit, Carbide expects to lower the acid's selling price from its current level of \$2.45 a lb.

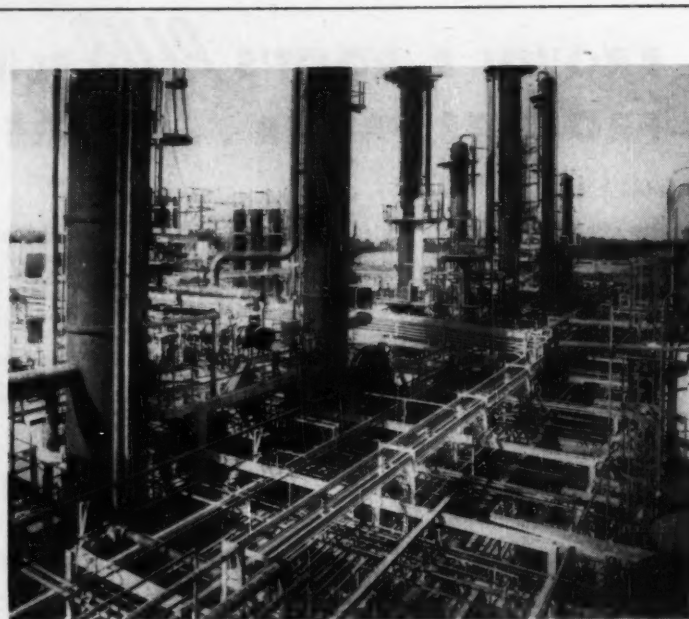
Sorbic acid (not to be confused with ascorbic acid, or vitamin C) is a six-carbon, straight chain organic acid containing two conjugated double bonds. A white, crystalline solid, it melts at 274 F.

Carbide has a nonexclusive license under a Best Foods, Inc.,

patent on use of sorbic acid for control of mold growth. This permits Carbide to grant sub-licenses to its customers. Royalties are included in the acid price.

Big Canadian Pulp Mill Gets Government Okay

A forestry project that includes a \$25-million pulp mill and a \$40-million paper mill at Minette Bay, B. C., has been conditionally approved by the British Columbia government. Kitimat Pulp and Paper Co. (formed by Aluminum Co. of Canada and Powell River Co.) expects to start a survey of forest areas this year, hoping to put the pulp and paper mills in operation by late 1958.



Latest Phenol-From-Cumene Plant Starts Up

Using its own process, Hercules Powder Co. is now making phenol from cumene at a new plant in Gibbstown, N. J. Annual capacity is 26 million lb. of phenol, 16 million lb. of acetone, plus coproducts methyl styrene and acetophenone.

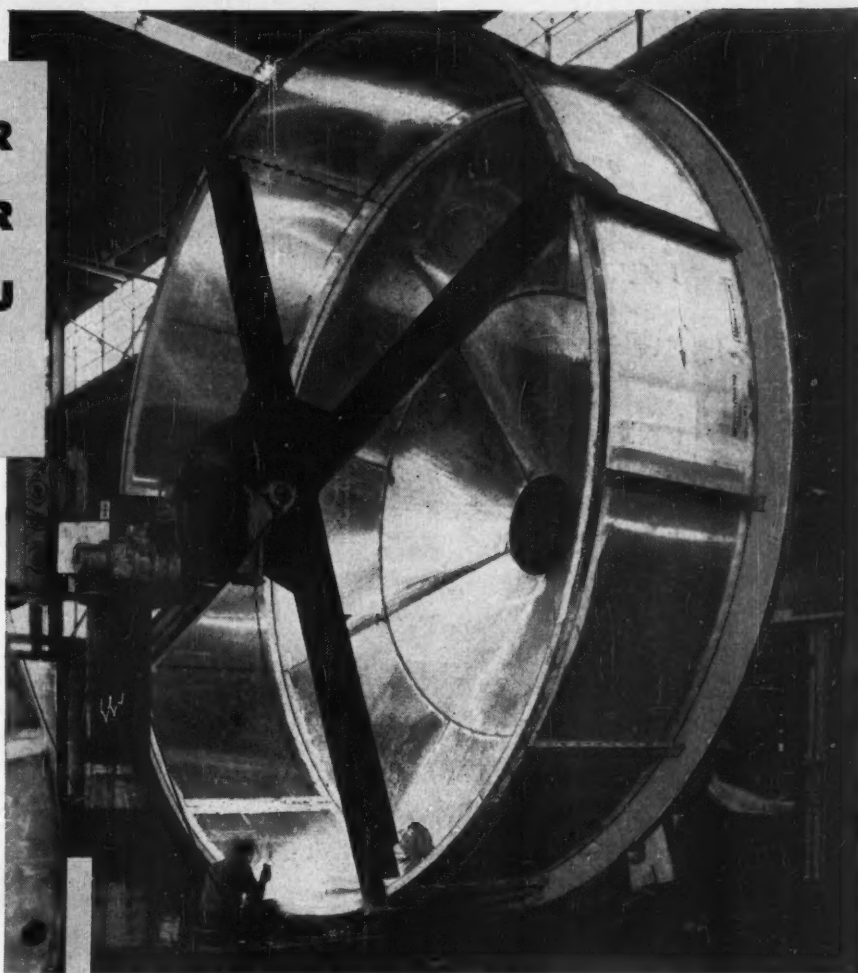
Briefly, the technique consists of alkylating benzene to cumene, oxi-

dizing cumene to its hydroperoxide, cleaving to phenol and acetone, and finally separation.

Actually, Hercules is the third North American firm to use the process commercially. Licensing it from Hercules are B. A. Shawinigan at Montreal and Standard Oil of California at Richmond, Calif.

**KNOW YOUR
FABRICATOR
BEFORE YOU
BUY**

*One
of a series
designed to
acquaint you
with*



WORKSCOPE

**fabrication
thru erection**

Men and machines—human skill as well as mechanical might—are the vital components of Nooter workscope . . . both available to you in expertly custom fabricated storage tanks and processing equipment.

Nooter is capable of fabricating any job from small pilot plant equipment to equipment requiring half a dozen flat cars to deliver. No assignment is too small, too large, or too complicated. Here are a few reasons why:

- Facilities for working from 12 gauge to 4" plate.
- Specialized experience in all the modern alloys—as well as steel.
- Complete follow-through—from shop fabrication thru field erection. Operating range anywhere in the U. S. A.
- Deliveries on time—at competitive prices.

May we offer you recommendations and estimates on your next job? Your inquiries are welcome and will receive prompt attention—with no obligation.

N O O T E R

C O R P O R A T I O N

Since 1896



1422 South Second St. • Saint Louis 4, Missouri

Steel and Alloy Plate Fabricators and Erectors . . . "Bellmokers"



RECORDING of data and . . . SORTING to match past jobs with today's inquiry . . .

Slash Time for Estimating Dryer Costs

Standard Steel's Norman Pitt shows how to cut engineering overhead while keeping prospective customers happy with fast answers to preliminary inquiries.

Punch-card coding of engineering and cost data on hundreds of rotary-dryer installations and estimates has, in the past year, slashed Standard Steel Corp.'s engineering overhead charges and drastically reduced the time required to estimate any given job.

The new system virtually eliminates the need for writing the prospective customer the letter which says, "Because of our heavy work load, we cannot supply a preliminary estimate in less than three weeks." Engineers of this Los Angeles dryer manufacturer can now answer the great majority of inquiries within two days.

Says Chief Process Engineer Norman Pitt, "Conservatively, we estimate that our card system is saving us well over \$10,000 a year. The cost of setting up the system was only \$3,000 total."

► **Cuts Engineering Costs**—Basic drive behind the punch-card system was the need to cut engineering and estimating costs on preliminary dryer bids.

Ratio of estimates prepared to orders landed in the dryer industry

is on the order of 10 or 20 to 1. About half of all initial inquiries received at Standard Steel ask only for budget information ("Not to exceed \$—"). Some of these, of course, later develop into requests for firm bids, but not many. Of the other half of initial inquiries—those asking for firm bids—there will often be changes in specifications before the customer finalizes his requirements. Here, too, not all firm bids end up as orders.

Since so many job estimates have to be made for each order landed, engineering overhead in the dryer business is exorbitant.

Pitt conceived the idea of storing dryer estimating data on punch cards a couple of years ago, installed the present system a little over a year ago. Experience over the past year has shown that cards having a double row of punched holes would be better than the present single-row cards. This would make it possible to pull out the desired cards directly, rather than through a process of elimination. Change-over to double-row cards will be made this year.

► **How System Works**—When an inquiry comes in, the sales department analyzes it to see whether a budget figure should be offered or whether the job requires firm engineering.

For a budget figure, the engineering department makes a rough heat balance, which indicates the Btu. requirement and the volume of gases to be handled. The material to be dried is classified by its characteristics—such as free-flowing, heat-sensitive or crystalline. In some cases Standard Steel's engineers will have had specific experience with that particular material; in other cases they look for materials of similar nature.

► **For Instance**—Pitt cites this example:

"Suppose we have a firm inquiry for a dryer to handle a material described by the customer as being similar to sand. The customer adds the specific requirements that the dryer be oil-fired and parallel.

"Our rough heat-balance calculations indicate that 22.6 million Btu. is to be provided and that 34,730 cfm. of air will be required. Taking everything into account, including our previous experience with this material, we decide that a 7-ft. dryer is needed.

"If we had no experience with this particular material, by using

NEW!

BROAD IN APPLICATION!

STANDARDIZED FOR LOW COST!

PATTERSON UNIMIXER DRIVE

VERY BROAD APPLICATION
IN THE 10 TO 50 H.P. RANGE

With these PROFIT FEATURES FOR YOU

- Four different models, for propeller, turbine, gas absorber and other mixing elements.
- Standardized for volume manufacture and lower cost.
- Sturdy construction for minimum maintenance, long life.
- Standard N.E.M.A. motors
- open, totally enclosed or explosion resistant.
- Side thrust carried by heavy duty anti-friction guide bearing.
- Direct and geared drive models available with anti-friction bearings, or stuffing box for vacuum or pressure operation.

**WRITE TODAY FOR THE
UNIMIXER BULLETIN
FACT FILLED,
JUST OFF THE PRESS**

Richard L. Carvony
President



The Patterson Foundry and Machine Company

East Liverpool, Ohio, U. S. A.

NEW YORK, BOSTON, BALTIMORE, PHILADELPHIA, PITTSBURGH, DETROIT, CINCINNATI,
ATLANTA, CHICAGO, ST. LOUIS, HOUSTON, DENVER, LOS ANGELES, SAN FRANCISCO,
SEATTLE

The Patterson Foundry and Machine Company, (Canada) Limited
Toronto, Canada
MONTREAL

RFQ <u>2.1636-B</u> STYLE <u>Countercurrent</u> MAT'L OF CONST. <u>A-7 Steel</u>									
JOB _____ HEATED BY <u>Natural Gas</u> GAS TEMP. IN <u>1,600</u>									
DATE <u>Dec. 21, 1953</u> SIZE <u>4' x 20'</u> GAS TEMP. OUT <u>280</u>									
PRODUCT <u>Clay</u> SPEED <u>10 rpm.</u> HEAT LOAD <u>4,664,250 + 15% Btu.</u>									
CUSTOMER _____ %H ₂ O IN <u>6</u> %H ₂ O OUT <u>< 0.2</u>									
DUST SYSTEM <u>6' Standard Cyclone - Pressure</u> BURNER <u>Nemec Multijet</u>									
MAT'L DISCHARGE <u>40,420 # Hood</u> FURNACE <u>8,300,000 Btu. - 42" I.D. x 51" Shell</u>									
MAT'L FEED <u>43,000 # - 7" φ Pipe</u> integral with discharge hood									
DRIVE <u>7½ Hp. - 84 rpm. Motoreducer</u> GEN'L DESCRIPTION:									
THRUST <u>1" Pitch</u> # TAKEN BY <u>Flange</u>									
TRUNNIONS <u>10" x 3" 2 FF 20F</u>									
WT. ON TIRES <u>10,140</u> TIRE FACE <u>2 ¾"</u>									
SEALS <u>Sand Dryer Type</u>									
LIFTERS <u>16, 3/16" x 7½" x 17' 5" S.T.</u>									
FAN Size <u>719 West.</u> FAN MOTOR <u>10 Hp. with cyclone</u>									
CFM <u>6,830</u> FAN MOTOR <u>7½ with stack only</u>									

IF A JOB—SEE OVER FOR TESTS

the cards we would pick out parallel, oil-fired dryers handling materials which are similar to sand and see what we considered as typical in those dryers. Conversely, if necessary we can determine typical operating conditions on similar materials and heat loads in the past.

"To get a quick price, we punch through the cards and pick out all parallel dryers, oil-fired, 7 ft. in diameter, handling materials similar to sand. In this instance, we sorted out a 7-ft. dryer, handling the same cfm., with the same drive and dust collection system we'd want in this case. Unfortunately, however, the heat requirement was different, since the operating conditions for the entering gases as specified by the customer are different than was the case in the estimate recorded on the card.

"But all we now have to do is poke through the cards again and find a dryer which had a 22.6-

million-Btu. furnace and add this furnace price to the price of the first dryer minus its original furnace. So essentially we can use the cards three times per bid—to determine dryer size, operating conditions and component costs."

► **Sources of Data**—In setting up the system in 1953, Standard Steel's engineering department combed its files back to 1949 for dryer and component data. Information was then coded on punch cards according to material, drying load, air stream, furnace, parallel vs. countercurrent flow, etc.

New cards are added to the files today only for jobs sold and installed. Exceptions are made for firm bids on dryers whose specifications involve conditions different from any in the existing file. In such cases a complete set of specifications is calculated in detail and entered on a card plainly marked as an estimate only.

Other sources of data are field trips and pilot-plant tests. "If anybody makes a field trip and sees a dryer working (it doesn't have to be our dryer) we make up a card and punch out the fact that it was somebody else's job. That way, we know that a dryer, irrespective of make, has successfully handled a certain material at a certain capacity under certain conditions.

"Along the same line, if we run a pilot test we enter that on a card, because that indicates a dryer actually ran under specific conditions. We also code cards on the basis of irrefutable hearsay. If we keep this up we might end up with case histories of every operating dryer in the country!"

Standard already has over 800 cards in its file. New ones are being added at an average rate of about ten each month.

► **Valuable Byproducts**—An important dividend of the punch-card



Take a tip
from the

"Dutch Boy"

NATIONAL LEAD PRODUCTS FOR THE CHEMICAL INDUSTRY



rely on LEAD to resist corrosion

Send for this **FREE 60-page book on
corrosion resistant Lead products**

Here, under one cover, you'll find information that may be valuable to you in solving corrosion problems.

The booklet contains sections on "Choosing Corrosion Resistant Materials", "Chemical Handling Capabilities of Lead", "Lead and Lead Lined Products", etc. It contains a series of graphs showing lead's corrosion resistance to various corrosive solutions. It gives you the data you want in making decisions on the specification and purchase of chemical handling equipment.

To get your copy simply fill in this coupon and mail it to the nearest Branch Office.

National Lead Company: New York 6; Atlanta; Baltimore 3; Buffalo 3; Chicago 80; Cincinnati 3; Cleveland 13; Dallas 2; Philadelphia 25; Pittsburgh 12; St. Louis 1; Boston 6 (National Lead Co. of Mass.); Los Angeles 23 (Morris P. Kirk & Son, Inc.); Toronto, Canada (Canada Metal Company, Limited).

NATIONAL LEAD COMPANY

Please mail me, without obligation, a copy of your book, "National Lead Products for the Chemical Industry." I would also like any special information you may have on the use of lead for _____

Name _____

Title _____

Firm _____

Address _____

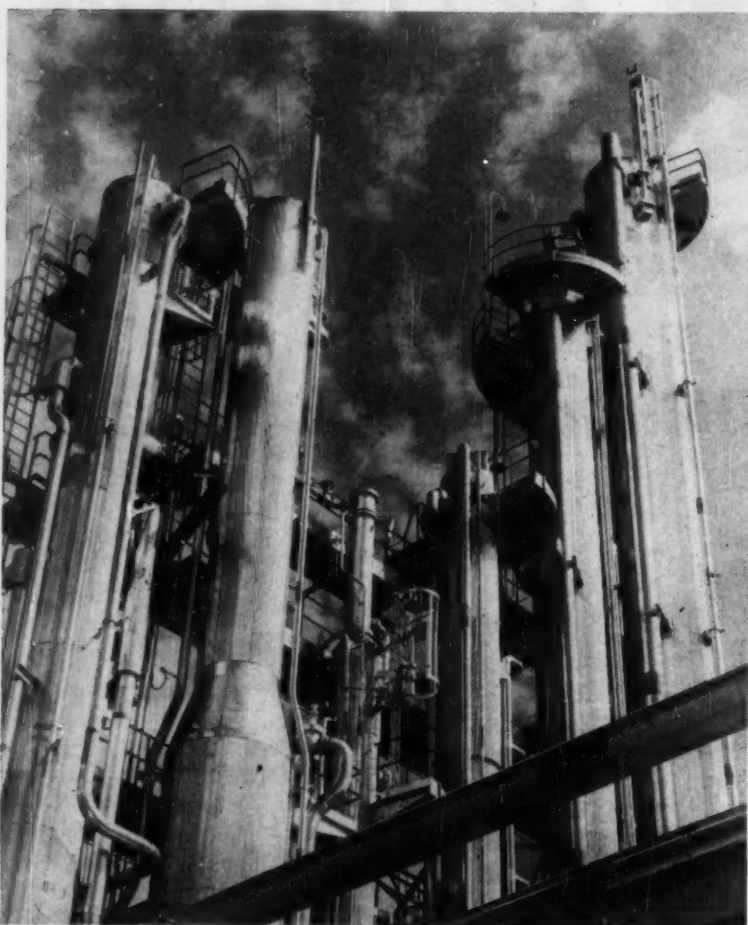
City _____ Zone _____ State _____

WHAT'S HAPPENING . . .

system is that it makes available to new engineers the experience of the older men. Since even oldtimers' memories are fallible, the cards provide permanent records of good dryer practice in this highly empirical field.

As another byproduct, Standard Steel's mechanical engineering department is now developing a card system to index engineering drawings of dryer components that may at some time be useful on another job.

Pitt's admonition in the use of punch cards is that since the make-up of the card itself is all-important, anyone setting up such a system should give much thought to just what he wants and how he can best get it.



FIRST OF SEVEN new U. S. plants scheduled to start up in next two years.

POLYETHYLENE:

Newest Plant Changes Form

Eastman Chemical Products has stolen a double march on the rest of the actual and prospective polyethylene makers, at least temporarily. Its just-finished Longview, Tex., plant became the first of seven planned new U. S. plants to

go on stream (and the first new source of polyethylene in over ten years). In addition, the firm is selling an entirely new polyethylene form—spherical pellets.

The process being used at Longview is licensed from Imperial

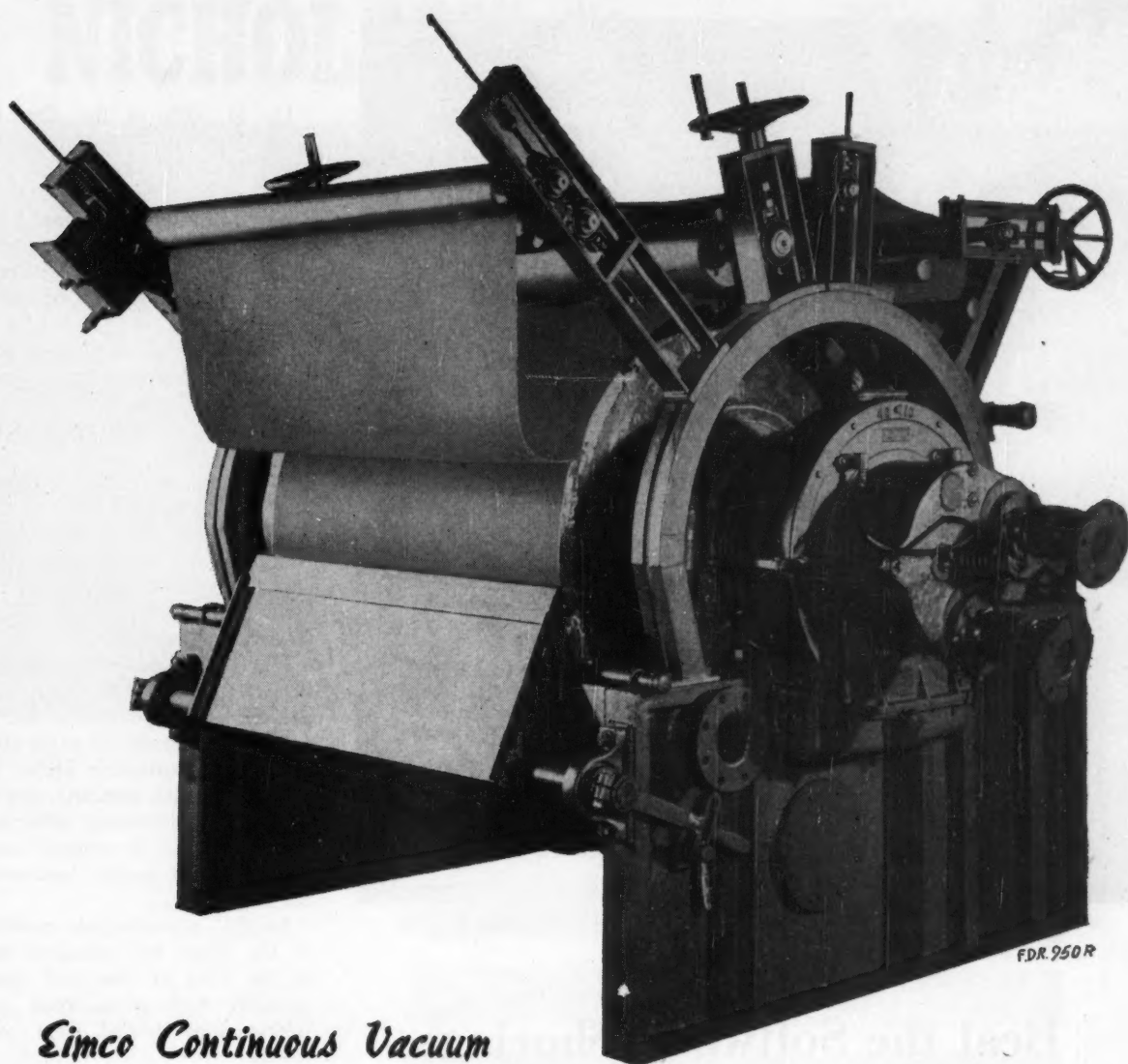


SPHERES: latest polyethylene form.

Chemical Industries of Great Britain. Details are a well-kept secret, but in general, ethylene is produced from propane, then polymerized. Total capacity of the \$8 million installation is about 20 million lb. a year.

Eastman's quite excited about its new pellets, tradenamed Tenite Polyethylene. They say that these will flow more uniformly from hoppers into the heating chambers of molding and extrusion machines than cubical pellets or granulations do. Because fewer fines are produced in the fabricating operations, cleaning the equipment is considerably easier.

Another advantage cited is that storage requirements can be cut by as much as 10%, due entirely to the spherical form. Also, spheres won't catch dust or other foreign materials, so are easier to keep clean in storage or in use.



Eimco Continuous Vacuum

Filters Using Compression Blankets

Another example of the many types of Eimco Continuous Vacuum and Pressure Filters. Filters of this type have been in use in many plants and provide many advantages where the material to be filtered produces a flocculent solid type cake.

Eimco filters of the type shown above, introduce a wash spray to the cake formation immediately after it emerges from the liquid in the tank and the compression blanket binds the cake to drum within a few inches of the slurry level. The blanket covers the cake to the blow zone above the scraper blade.

This type Eimco filter prevents cake cracking, greatly improves washing and on some types of filter cake, will reduce moisture content in the cake by 8-10%.

Write for more information.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • **Export Offices: Eimco Bldg., 52 South St., New York City**

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kalamazoo, Mich. London, Eng. Paris, France Milan, Italy



B-80

You Can't Beat An Eimco!



COOKED HARDWOOD tumbles from digester in pulping process that will . . .

Beat the Softwood Shortage

First low-cost, high-grade, hardwood pulp is coming from Great Northern's 350-ton-per-day mill. It's a significant shift in utilization of wood for papermaking.

Newsprint pulp from hardwood, by the new "chemigroundwood" process, accounts for Great Northern Paper Co.'s ability to undertake its capacity-tripling \$45 million expansion at East Millinocket, Me., with the first phase now completed and operating.

As the added capacity came into operation late in November, company officials substantiated previous reports: Only by bolstering inadequate supplies of local softwoods could Great Northern undertake such a whopping expansion. And they expect the chemigroundwood

process to fill the gap by pulping hardwoods—principally yellow birch, white birch, hard and soft maple, beech and poplar.

► **More Than Fills the Gap**—With the new process Great Northern is not only holding production costs in line but producing a high-quality pulp to boot. Such a pulp has the dreamed-of combination of 85-90% yield, good brightness without bleaching, three-fold boost in strength over spruce and fir groundwood pulp, and smoother-finished newsprint that reduces ink consumption on the printing presses.

Up to 30% of the fiber in Great Northern's newsprint now comes from the new 350-ton-per-day chemigroundwood pulp mill. Softwood fiber being displaced by the chemigroundwood is mostly groundwood, with some cutback in the sulfite fiber that normally comprises 20% of newsprint.

With this readjustment in raw material consumption ratio Great Northern unlocks a reserve of hardwood representing 40% of its holdings.

More important, it's a significant step in an over-all shift of raw material base throughout the Northeast and Lake states. And it's doubly significant that Great Northern is the nation's leading producer of newsprint.

► **Why Softwoods Are Short**—During the past 30 years this country, with a population rise of 44%, has increased its paper consumption approximately 240%. In the face of such booming growth we are now overcutting softwoods by about 20%. By contrast, only about 80% of mature hardwoods fall to the ax.

In 1953 approximately one-fifth of the paper we consumed was in the form of newsprint made primarily from groundwood and sulfite pulps derived from softwoods.

Newsprint is a large-volume, low-price product that is particularly sensitive to shifting cost factors. With softwoods being overcut domestic mills have faced rising pulpwood costs due in part to longer hauls from forest to mill. Result—domestic newsprint production has fallen to 20% of total consumption, with Canada supplying the balance from more economic operations.

► **Regaining Market**—Newspaper publishers would like to see U. S. mills supply a greater share of the newsprint demand. They are even willing to invest reasonable amounts of their money if raw materials are available.

However, present softwood timber supplies are not ample enough to permit substantial expansion. The best supply of softwood for new capacity is now the forests

NICHOLSON Steam Traps'

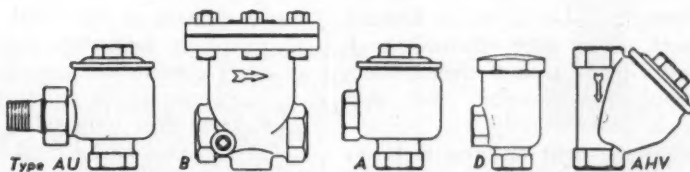


1 Initial Cost

2 Upkeep Expense

3 Warm-Up Time

4 Production Time



SIX TYPES FOR EVERY PROCESS, HEAT, POWER USE
 $\frac{1}{4}$ " to 2" sizes for pressures from vacuum to 300 lbs. Bronze, monel
 or stainless steel bellows. Bronze, semi-steel or cast steel bodies.

SEND FOR TRAP CATALOG 953

W. H. **NICHOLSON** & CO.



TRAPS • VALVES • FLOATS

206 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities

WHAT'S HAPPENING . . .

of Alaska. Expansion elsewhere, based on softwoods, would seriously affect timber resources and other wood-consuming industries.

Yet there are good hardwood resources within the northeastern and north-central sectors of the U. S. That's why Great Northern's use of hardwoods is both important and significant.

► **Why Not Sooner**—With all evidence pointing to the desirability of using hardwoods, why haven't more newsprint producers been using them? The answer lies primarily in the nature of hardwood pulp.

Newsprint contains a large portion of low-cost groundwood fiber. It's made by grinding logs into fibers with revolving stones—a simple, direct and inexpensive way.

Groundwood pulp must be strong and bright. Otherwise more than the normal 15-25% of costlier chemical sulfite or kraft pulp will be needed to produce the finished sheet of newsprint.

Pulp made by grinding hardwood generally does not meet these requirements. High-density hardwoods, such as birch, beech and maple, yield groundwood pulps with very low strength and poor color.

Among lower-density hardwoods only poplar approaches softwood in quality of groundwood pulp. Even then it requires a greater percentage of higher-strength chemical fiber to produce finished newsprint. Or it can be blended with other, more expensive hardwood pulps, such as chemigroundwood, semichemical and cold soda.

In the light of these facts it's easy to see why today only two newsprint producers are using groundwood from hardwood. Ontario Paper Co., Thorold, Ont., fills 18-20% of its total groundwood requirement with poplar. Hennipin Paper Co., Little Falls, Minn., uses substantial amounts of poplar groundwood in its newsprint.

► **Elements of Success**—Despite these serious drawbacks Great Northern couldn't afford to overlook the ready availability and low

Convention Calendar

Instrument Society of America, sixth annual Southeastern Symposium, University of Florida, Gainesville, Fla., Jan. 31-Feb. 2.

Society of the Plastics Industry, tenth annual Reinforced Plastics Division conference, Hotel Statler, Los Angeles, Feb. 8-10.

American Institute of Mining and Metallurgical Engineers, annual meeting, Conrad Hilton Hotel, Chicago, Feb. 13-17.

American Society of Mechanical Engineers, national meeting observing 75th anniversary, "The Engineer and His Communications," Engineering Societies Building, New York, Feb. 16.

National Society of Professional Engineers, annual spring meeting, Hotel Charlotte, Charlotte, N. C., Feb. 18-19.

Technical Association of the Pulp and Paper Industry (TAPPI), annual meeting, Commodore Hotel, New York, Feb. 21-24.

Chemical Institute of Canada, Chemical Engineering Division's fifth conference, 18 Rideau St., Ottawa, Ont., March 7-9.

American Institute of Chemical Engineers, Kentucky Hotel, Louisville, Ky., March 20-23.

cost of hardwood delivered to its mill.

Cost of wood is the largest single element in the total cost of producing newsprint. Because of closer proximity, delivered cost of hardwood can be as much as 20% lower than softwood.

Casting about for the most likely hardwood pulping procedure, Great Northern chose the chemigroundwood process evolved at the New York State College of Forestry, Syracuse. This process seemed to offer a good combination of the best features of the older chemical and groundwood pulping processes, provided ways and means could be found to improve the unbleached brightness of the pulp.

Early in 1952 Great Northern built a complete pilot plant of its own design to manufacture

chemigroundwood pulp. Successful operation of this unit led to construction of a commercial 50-ton-per-day plant completed and put into operation in February 1953; culminated in the new 350-ton-per-day pulp mill that is a major factor in the daily output at East Millinocket.

► **New Slant**—An entirely new approach to pulping underlies chemigroundwood's success. In brief, 4-ft. hardwood logs are first subjected to vacuum, then cooked under pressure with neutral sulfite liquor. After cooking, the logs are reduced to individual fibers by grinding with a special dull stone.

Wood is cooked just enough to unlock the fibers so they can be ground apart with ease. Result—fibers undamaged by excess cooking or physical violence, 85-90% yield and a big saving in power consumed for grinding.

In other hardwood pulping processes it is necessary first to reduce the log to chips, then cook the chips down to 70% yield before they can be reduced to fiber with attrition mills. Cooking to this extent lowers the brightness so that the pulp must be bleached. Bleaching reduces yield to 55% and further increases cost.

► **New Plant**—In Great Northern's chemigroundwood pulp mill the logs are charged into steel pressure cookers 10½ ft. in dia. by 62 ft. high. A vacuum of approximately 28 in. Hg. is drawn on the sealed vessel for 30 min.

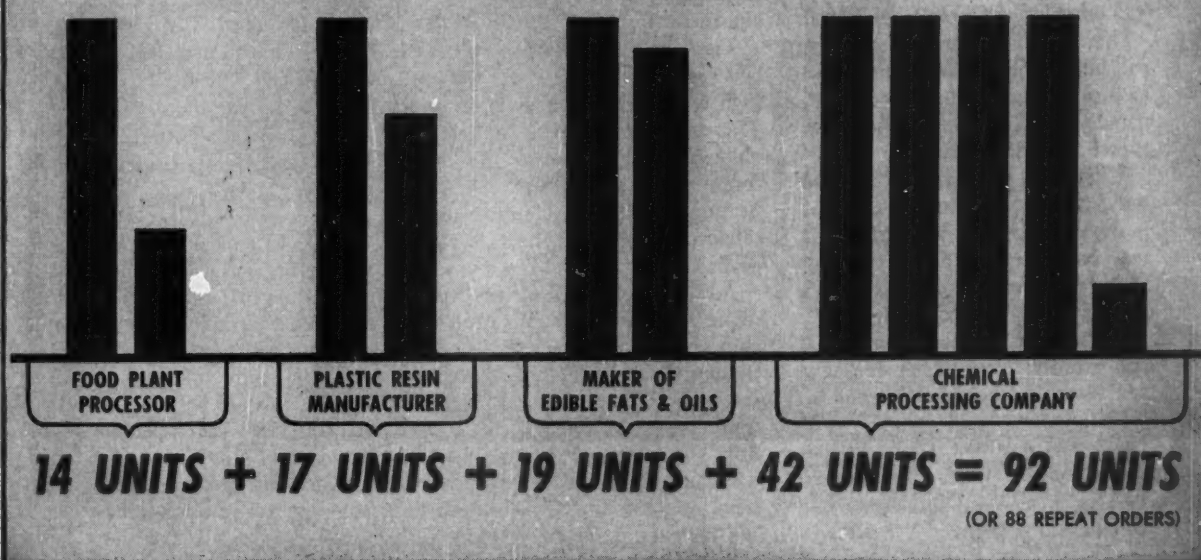
Neutral sulfite liquor, containing sodium sulfite and sodium bicarbonate, then is introduced and heated with steam to 130-150 C. by circulating through an external heat exchanger.

Additional liquor is pumped in until pressure reaches 150-200 psig. Pressure and temperature are held for 6 hr.

At the end of the cook, the liquor discharges into an accumulator, where it is fortified with chemicals for reuse. Cooked logs discharge through hydraulically operated bottom doors into pits for transfer by conveyor to the grinder room.

Pulp from the grinder is screened

**REPEAT ORDERS of four companies for
FOSTER WHEELER HEATING SYSTEMS**



A Story of Satisfaction-*retold 88 times*

*Ever-growing volume of repeat orders for
Foster Wheeler high-temperature low-pressure heating
systems your best assurance of FW's specialized
knowledge to solve critical processing problems.*

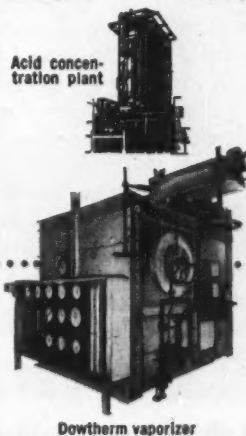
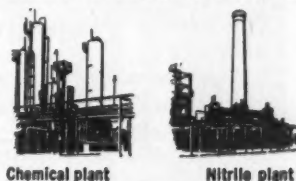
IN the design of specialized process equipment, nothing can take the place of experience. For in no other way can the vast technical knowledge—so essential to success—be obtained.

This holds particularly true of high-temperature low-pressure heating systems for improving product quality at lower cost. Here, the importance of Foster Wheeler's twenty-one years' experience in designing over 450 Dowtherm units totalling more than 1,500,000,000 Btu per hr cannot be

overemphasized. These vary from the smallest (44,500 Btu per hr at 700F and 88 psi) to the largest (45,000,000 Btu per hr at 700F and 88 psi).

The satisfactory operation of the four different Foster Wheeler installations charted above—and the eighty-eight repeat orders that followed—establishes a record in successful processing performance that speaks for itself! For information, write Foster Wheeler Corp., 165 Broadway, New York 6, N. Y.

**TYPICAL FOSTER WHEELER
PROCESS HEATING SYSTEMS**



FOSTER WHEELER

WHAT'S HAPPENING . . .

and thickened prior to entering the stock chest ahead of the paper machine.

► Economics of Chemigroundwood

—There's good evidence that there will be significant savings in manufacturing chemigroundwood compared with groundwood from spruce or other softwoods.

Chemical pretreatment is the only chemigroundwood step that is more costly, and that extra cost may be offset by reduced grinding costs. Power consumption in grinding is approximately 50% less than for spruce groundwood, and grinders have higher throughput rates on chemigroundwood.

Further information can be found in the Second Progress Report of the Dept. of Commerce to the Committee on the Judiciary, House of Representatives; Study of Newsprint Expansion, Part II, Newsprint Production From Hardwoods.

National Engineers' Week Coming This Month

February 20-26 will be observed as National Engineers' Week. Sponsored by the National Society of Professional Engineers, its purpose is to focus public attention on the importance of the engineering profession to this nation's future welfare.

Says committee chairman Anatole Gruher: "The future prosperity of our country and her very safety are dependent upon continued ingenuity in the engineering application of scientific discoveries to increased productivity and to military preparedness. Yet the creative role of the engineer as a designer, a developer, a production organizer, is rarely understood."

Over-all theme for 1955 is "Engineering—Builder of a Brighter Future." A series of events is planned during the week by the 324 Society chapters, in conjunction with local branches of other engineering societies.

Lab Makes Titanium by Catalytic Distillation

Pure titanium metal has been produced in the laboratories of Britain's Fulmer Research Insti-

tute using "catalytic distillation." The process is similar to one used to make laboratory quantities of aluminum.

Titanium tetrachloride passes over titanium ore and catalyst at high temperature and low pressure. The tetrachloride gives up some chlorine to titanium in the ore, forming lower chlorides. On reheating in an inert atmosphere, tetrachloride is reproduced, leaving beads of pure metal.

Advantages claimed for the technique are that there's no need to chip out the metal; process is continuous; tetrachloride is recovered automatically; you can work straight from the ore; product is pure. But possibly outweighing all of these are the disadvantages of extreme conditions of low pressure and high temperature.

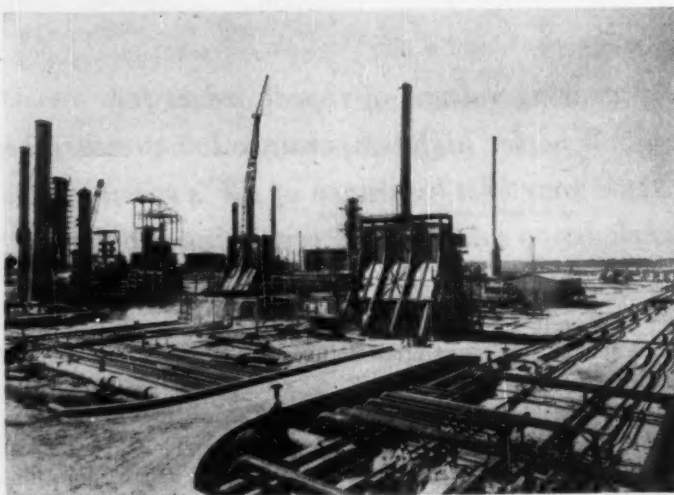
So far Fulmer has only a vague

idea of the economics of the process compared with magnesium reduction or electrolytic methods now being developed. But a pilot plant is being built to make the necessary comparisons.

New Group Entering Fertilizer Markets

Gulf Chemical Co., a newly formed firm, plans to build a plant near Pensacola, Fla., to make 200 tons a day of anhydrous ammonia—part of which will go into nitric acid and ammonium nitrate—and 40 tons a day of polyvinyl chloride. It's estimated that operations will begin early in 1956.

The \$26.8 million project is an outgrowth of research done by National Research Corp. at Cambridge, Mass.

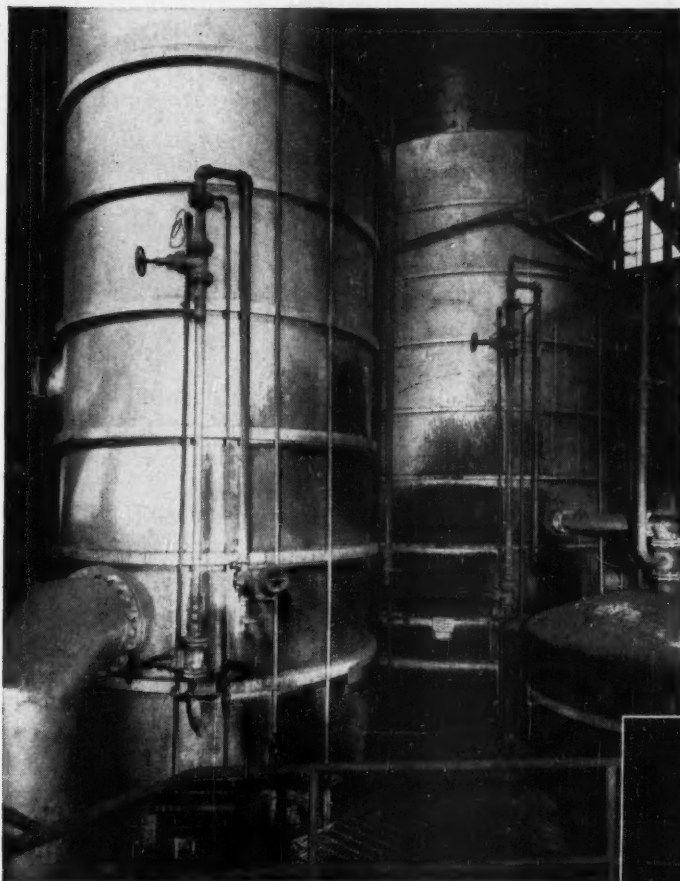


Australian Refining Rising 800 Percent

Led by the 60,000-bpd. Anglo-Iranian refinery now being built near Fremantle (above), Australia's oil refining capacity is in the midst of a mammoth 800% expansion. Now the country has five small plants processing 18,000 barrels of crude a day. But five new refineries under construction will boost throughput to 164,000 bpd. by 1956.

The \$115 million Anglo-Iranian project, which is being designed and built by M. W. Kellogg and its subsidiaries, is easily the biggest. But the others are good-sized, too. They include: Shell Oil at Geelong (36,000 bpd.), Vacuum Oil at Altona (22,000 bpd.), Cal-Tex at Kurnell (22,000 bpd.), and Bitumen and Oils (6,000 bpd.).

A Chemical Plant Needs...



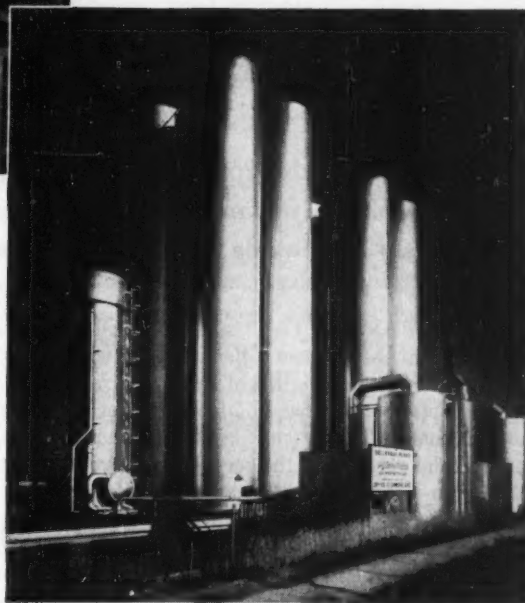
Conkey all nickel construction Triple Effect Evaporators producing 50 per cent caustic liquor.

● Conkey designed and engineered equipment, such as the Conkey all nickel construction Triple Effect Evaporator shown above, is fabricated in Chicago Bridge & Iron Company's four strategically located shops and erected by CB&I experienced crews. Conkey engineers will be happy to assist you with any crystallizing, evaporating or filtering problems your plant may have.

● CB&I designs, fabricates and erects welded steel plate structures of all types. The CO₂ towers shown at the right were erected for the Liquid Carbonic Corporation plant at Belleville, N. J. When you plan processing equipment, pressure storage tanks or flat-bottom storage tanks, write our nearest office.

Filters
Evaporators
Crystallizers
Processing Towers
Pressure Vessels
Flat Bottom Tanks

... and many other welded steel plate structures, all built to exacting standards. Conkey and CB&I engineers are ready to help solve your problems. Just write your nearest CB&I office for further information, estimates or quotations.



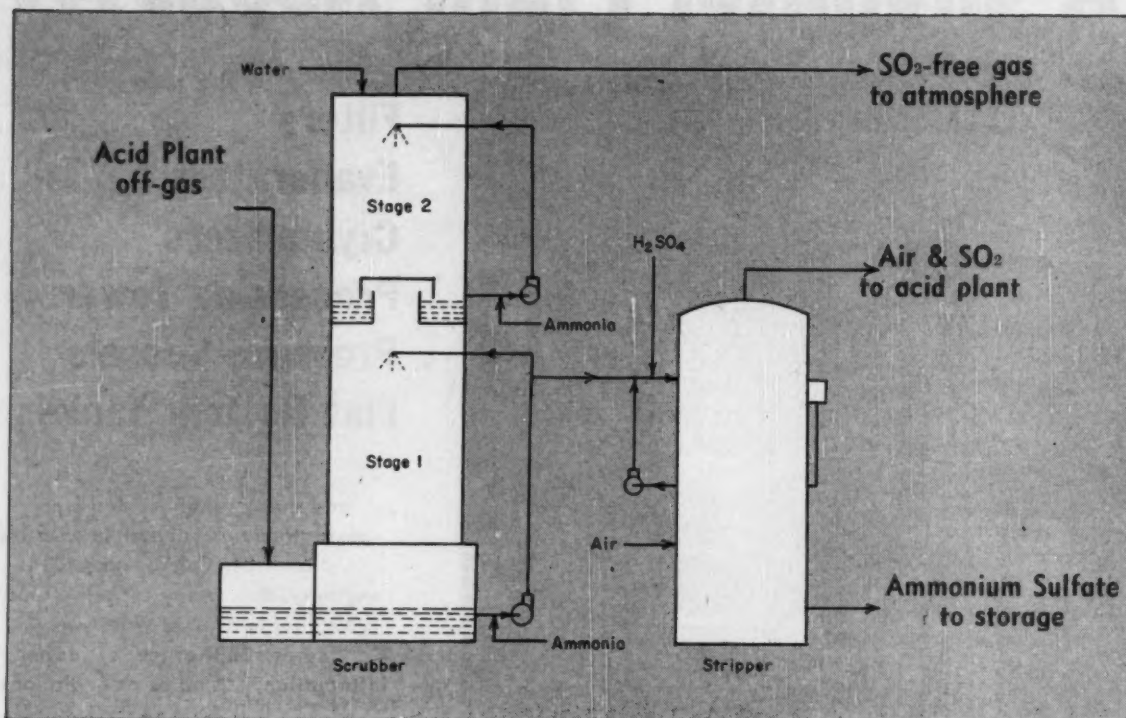
Eight 12-ft. diam. by 100-ft. carbon dioxide towers fabricated and erected by CB&I.

CHICAGO BRIDGE & IRON COMPANY

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

CONKEY
EQUIPMENT

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
Los Angeles • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • Tulsa • Washington



SO₂ Absorber: Two Scrubs Better Than One

Double absorption system used to solve air pollution problem. Ammonium sulfite-bisulfite solutions remove sulfur dioxide from sulfuric plant's waste gases.

At its Pasadena, Tex., sulfuric plant, Olin Mathieson Chemical Corp. is now operating a scrubbing and stripping unit that eliminates objectionable fumes and at the same time gets rid of the scrubber liquor in a way that avoids stream pollution. Another benefit: 20% higher production rates.

An equipment breakdown on the night of July 11, 1952, resulted in considerable public pressure on Mathieson to combat air pollution caused by SO₂ and SO₃ emanating from its acid plant. Extensive research indicated that the only feasible disposal method was a scrubbing system utilizing ammonium sulfite-bisulfite solutions.

Since Consolidated Mining & Smelting Co. of Canada Ltd. had

had considerable experience with a similar unit, a license to use their system was acquired; Mathieson's engineers then made a number of changes in design and operation to meet local conditions at the Pasadena plant. The equipment was installed at a cost of \$340,000.

Today, Olin Mathieson has exclusive licensing rights in the U.S. to this process, developed originally by Consolidated and known as the Cominco SO₂ recovery process. Western Sulphur & Acids Div., set up at Little Rock, Ark., by Olin Mathieson, will offer engineering consulting service or will undertake design, installation and initial operation of the process under contract to licensees.

► **Two-Pass Scrubber**—A new fea-

ture of the setup is the use of a double scrubbing tower—actually two separate scrubbers built one above the other. Advantages of two-stage scrubbing: first or lower scrubber gives minimum formation of byproduct ammonium sulfite for a given load of SO₂ removed; second scrubber provides maximum pickup of the remaining SO₂.

Designed to handle SO₂ concentrations as high as 0.9 percent—resulting from acid plant startups and upsets—the unit's over-all absorption efficiency is extremely high; tail gases contain less than 0.03 percent sulfur dioxide. Scrubbers using a single solution are usually less efficient.

► **Temperature Is Low**—Fumes from the sulfuric plant pass through a 4-ft. diameter steel line and enter the bottom of the lower scrubbing section. Although this gas is at a temperature of 170 deg. F., general cooling in the scrubber, brought about by evaporation of water from

HIGH PURITY PHENOL

The Oronite manufacturing process permits the consistent marketing of a highly pure Phenol. Exceeding the U. S. P. congealing point specification of 39.0° C, Oronite's guaranteed minimum is 40.6° C—with actual shipments being regularly higher. This dependable high quality, at competitive prices, suggests Oronite as a leading Phenol source.

Oronite, with complete control of all basic raw materials in its manufacturing process is truly a 100% *basic source* of supply. Thus with Oronite you are assured of a reliable Phenol source, service and product when you need it.

Contact any Oronite office for further product and supply information.

A partial list of Oronite Products

Detergent Alkane	Wetting Agents	Purified Sulfonate	Para-Xylene 95%
Detergent Slurry	Cresylic Acids	Polybutenes	Ortho-Xylene
Detergent D-40	Gas Odorants	Acetone	Xylol
Detergent D-60	Lubricating Oil	Naphthenic Acids	Aliphatic Acid
Dispersant NI-O	Additives	Phthalic Anhydride	Hydroformer Catalyst
Dispersant NI-W	Sodium Sulfonates	Maleic Anhydride	Fuel Oil Additives

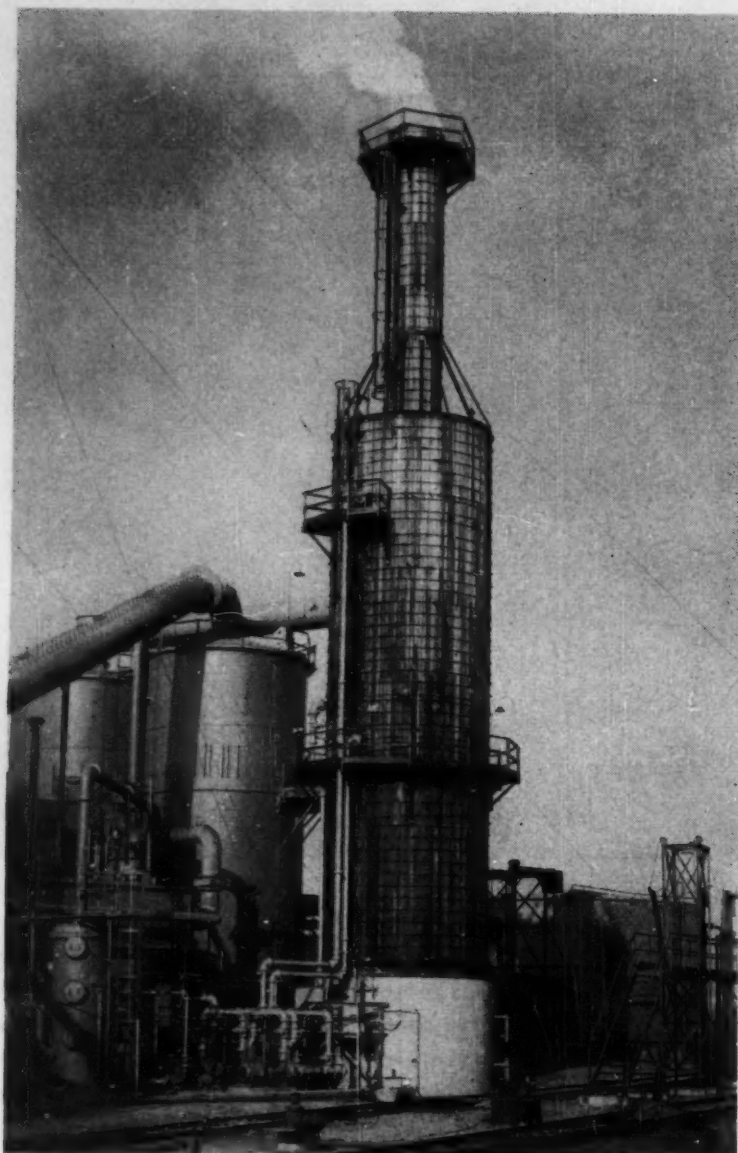
Basic Chemicals for Industry

ORONITE CHEMICAL COMPANY

200 Bush Street, San Francisco 20, California • 714 W. Olympic Blvd., Los Angeles 15, California
30 Rockefeller Plaza, New York 20, New York • 20 North Wacker Drive, Chicago 6, Illinois
Mercantile Securities Building, Dallas 1, Texas

3263





TWOSTAGE scrubber removes SO_2 from sulfuric plant's offgas.

the solutions, keeps process solutions in both towers at 100 F.

Water fed continuously to the top of the upper scrubber maintains the low solids concentration necessary to efficient absorption. Weak solution overflows from the top to the bottom section; strong solution in the lower section is pumped to a stripping tower. Both solutions are circulated by pumping from the base of each section to a distributor at the top of each.

Solution pH in both sections of the tower is controlled with anhy-

drous ammonia. The ammonia is introduced into the circulating pump suction lines, where it is thoroughly mixed by the pumping action before entering the sections.

► **Countercurrent Flow**—Inlet gases pass countercurrent to the first scrubbing solution, which removes most of the sulfur dioxide. Gas then moves from the lower scrubber through a chimney to the upper section, where a weak ammonium sulfite-bisulfite solution removes any remaining SO_2 . Tail gases—primarily air and steam—are discharged

through a stack to the atmosphere.

► **Recovery by Stripping**—Solution buildup in the lower scrubber is continuously bled off to an air-blown, bubble-plate stripping tower where it reacts with sulfuric acid from the acid unit to form ammonium sulfate and SO_2 . Free SO_2 is forced under pressure back into the drying tower of the sulfuric plant and passed through the catalyst trays.

Acid feed to the stripping tower is 93 percent because that's the strength acid normally circulated through the drying tower and therefore is readily available. The acid feed rate to the stripper is regulated by pH controller.

► **pH Control**—Care is used to prevent the pH of either scrubber solution from rising appreciably above the control point since a heavy fogging condition results from the formation of ammonium sulfite in the gas stream. Both pH controllers are equipped with high pH signal alarms which immediately stop all ammonia feed to the unit. A check pH recorder monitors the pH control of the solutions and will also stop ammonia feed to the system should the pH rise too high.

By product ammonium sulfate solution resulting from the scrubbing and stripping operation is pumped to the company's adjacent fertilizer plant. Mathieson expects that at least 97 percent of the ammonia fed to the unit will be recovered as sulfate.

► **Big Tower, Low Pressure**—The scrubbing tower is oversized to hold pressure drop to a minimum and prevent loss of production rate for the acid plant, a Leonard-Monsanto unit with a design capacity of 400 tons per day. Both scrubbing sections are equipped with wood slat packing and spray type distribution. Special materials of construction include redwood for scrubbers, Karbate for the mixing tee at the stripper and lead-lined steel for the stripper.

Since the SO_2 recovery unit is provided with automatic controls throughout, little attention from the acid plant operators is required and no additional operating personnel is necessary.

Enjay assures you top product quality



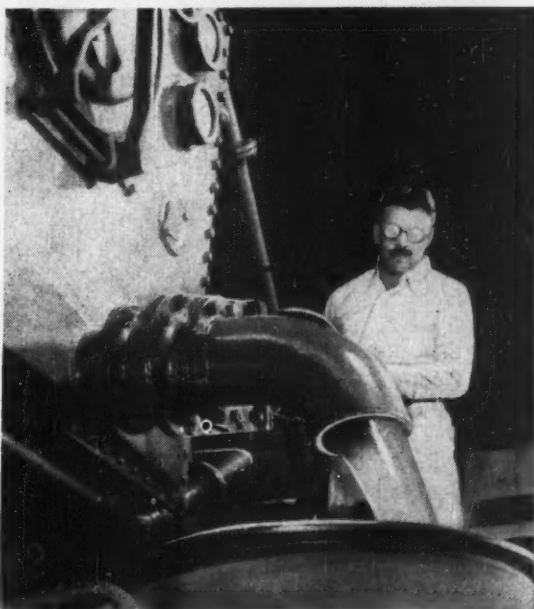
IN SURFACE COATINGS (*Paint, Varnish and Shellac*)

You can depend on Enjay for the quality ingredients that make your product a sales success. Enjay offers a complete line of petroleum chemicals to the surface coating, chemical and petroleum industries . . . backed by 35 years of research, know-how and proved results. Enjay is also ready to assist you in developing new or improved products through chemistry. Next time, call Enjay for *your* chemical needs.

CHEMICAL ENGINEERING—February 1955



IN PETROLEUM (*Lubricants and Gasoline Additives*)



IN CHEMICALS (*Plastics*)

PETROLEUM

PARANOX
PARATONE
PARAFLOW
PARAPOID
PARADYNE
PARATAC
PETROHOL
Methyl Ethyl Ketone
Dewaxing Aid
Ethyl Ether
Isopropyl Ether
Reference Fuels

SURFACE COATING

PETROHOL 91
PETROHOL 95
PETROHOL 99
JAYSOL
Secondary Butyl Alcohol
Secondary Butyl Acetate
Isopropyl Acetate
Acetone
Methyl Ethyl Ketone
Dicyclopentadiene
Ethyl Ether
Isopropyl Ether
Naphthene Acids
Iso-Octyl Alcohol
Decyl Alcohol
Denatured Ethyl Alcohol

CHEMICAL

PETROHOL 91
PETROHOL 95
PETROHOL 99
JAYSOL
Iso-Octyl Alcohol
Decyl Alcohol
Denatured Ethyl Alcohol
Tridecyl Alcohol
Dicyclopentadiene
Isoprene
Butadiene
Ethyl Ether
Isopropyl Ether
Tetrapropylene
Tripropylene
Aromatic Tars
Benzene
Acetone
Methyl Ethyl Ketone



**35 successful
years of
leadership in
serving industry**

Enjay Company, Inc.

15 West 51st Street, New York 19, N. Y.

WHAT'S HAPPENING . . .

British to Use Sodium Reduction for Titanium

Imperial Chemical Industries will be the world's first commercial user of a sodium reduction process for titanium sponge. ICI expects to beat out Union Carbide, which will employ a similar process at the plant it's building in Ashtabula, Ohio, by at least half a year.

At present only a pilot plant is using the process. But the main British plant (1,500 tons a year) will be operating by this April, with full production coming in August. Carbide doesn't expect to start up its 10,000-ton plant until early in 1956.

Japanese Use Calcium In Titanium Processing

By direct reduction of titanium dioxide with metallic calcium, the Japan Metallic Titanium Mfg. Corp. of Tokyo says it can make titanium powder of 300-400 mesh. Production now is 1.5 tons a month, but will jump to 10 tons this year. Any that is exported to the U.S. will be priced at \$6.50 a lb., including freight and insurance.

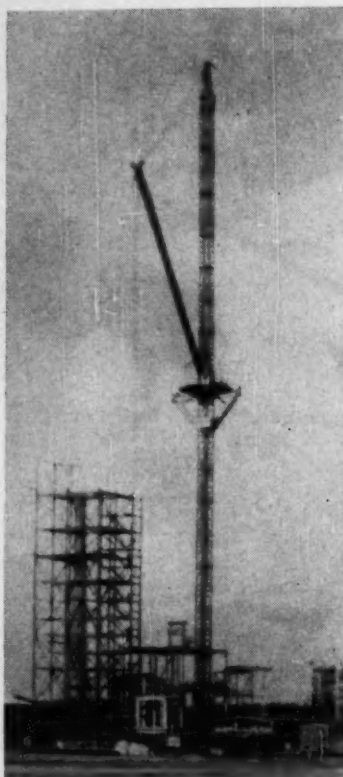
One use the company is making of its powder is in a durable, heat-resistant alloy (95% aluminum-5% titanium) called Titanize, used for surface treatment of steel. Treating cost runs about \$167 per ton of steel. (For other possible uses of titanium powder, see *Chem. Eng.*, Aug. 1954, p. 104.)

Big Pilot Plant to Use Acid Leach for Nickel

Compromising its initial hopes to go directly into commercial production, Freeport Sulphur Co. has contracted with the General Services Administration to build a 50 ton per day pilot plant near New Orleans to produce nickel and cobalt. Charging lateritic iron ores from Cuba, the unit will test a sulfuric acid leaching process.

GSA will pay construction costs of the semicommercial plant, plus

operating costs for one year, up to a total of \$61.4 million. In addition, the agency has the right to buy 150 million lb. of nickel and 15 million lb. of cobalt at prevailing market prices until June 30, 1963.



New Houdriflow Needs 425-Foot Guy Derrick

The highest guy derrick ever erected on this continent—425 ft., equivalent to a 35-story office building—is now being used at the Montreal refinery of Canadian Petrofina, Ltd. There a 285-ft. Houdriflormer is being built by Canadian Vickers, Ltd., for the Lummus Co. of Canada, general contractor.

Originally used on a similar unit in Germany (see cut), the derrick's mast (215 ft.) and boom pivot on a tower of open girder construction 210 ft. high and 84 inches square. Its use has permitted shop fabrication of the tower in 16 sections instead of fabricating at the site as is customary. As assembled, the derrick can lift 80 tons to a height of 400 ft.

News Briefs

Newsprint: Georgia Pacific Plywood Co. says it's "willing and able" to make a \$50 million "gamble" on the construction of a newsprint pulp mill near Juneau, Alaska.

Ag chemicals: Pacific Supply Co-Operative will buy all but 50 tons of anhydrous ammonia and 15 tons of urea of the daily output from a \$12 million plant to be built by Columbia River Chemical Corp. at Attalia, Wash. Total output will be 160 tons anhydrous ammonia, 110 tons urea, 140 tons ammonium sulfate a day.

Consolidation: Buffalo Electro-Chemical Co. has been merged with its parent corporation, Food Machinery and Chemical Corp. It will operate as the Becco Chemical Division from now on.

Vinyl resins: National Starch Products has bought a tract of land at Meredosia, Ill., for construction of the company's second vinyl resin plant. First is located at Plainfield, N. J.

Fertilizers: Jefferson Lake Sulphur Co. will build a sulfuric acid plant and a triple superphosphate plant in southeastern Idaho. Triple super capacity is set at 80,000 tons a year. Cost of the projects, which are expected to be completed late in 1955, is more than \$3 million.

Progress: The second Chemical Progress Week has been scheduled for May 16-21, 1955.

Titanium: Full capacity production of 10 tons a day of titanium sponge has been achieved by the Titanium Metals Corp. of America at its Henderson, Nev., plant.

Petroleum: Sometime this summer, American Oil Co. will start building a \$25 million, 35,000 bpd. oil refinery near Yorktown, Va.

For the **TOUGHEST** Concentrating and Separating Jobs



*TWENTY Sharples DH-2SG's in the
Penick and Ford, Cedar Rapids, Iowa plant.*

The Sharples High Capacity, Heavy Duty Concentrator...

Here is the heavy duty concentrator industry has been waiting for . . . engineered by Sharples with all the "heft", extra power and rugged sanitary construction that the tough jobs require . . . plus flexibility to control solids concentration regardless of variations in feed rate, and slurry concentration.

This new Heavy Duty Nozzlejector is capable of handling loads up to 40 HP input without power loss or motor strain . . . because of the exclusive massive parallel drive . . . covers of this continuous nozzle centrifuge are capable of handling up to 175 gallons/minute . . . nozzles and bushings are made to take long hard service . . . construction is sanitary and easy to clean.

*Get the facts about this new "work horse" centrifuge for the really tough concentrating jobs.
Write for Bulletin 1276.*

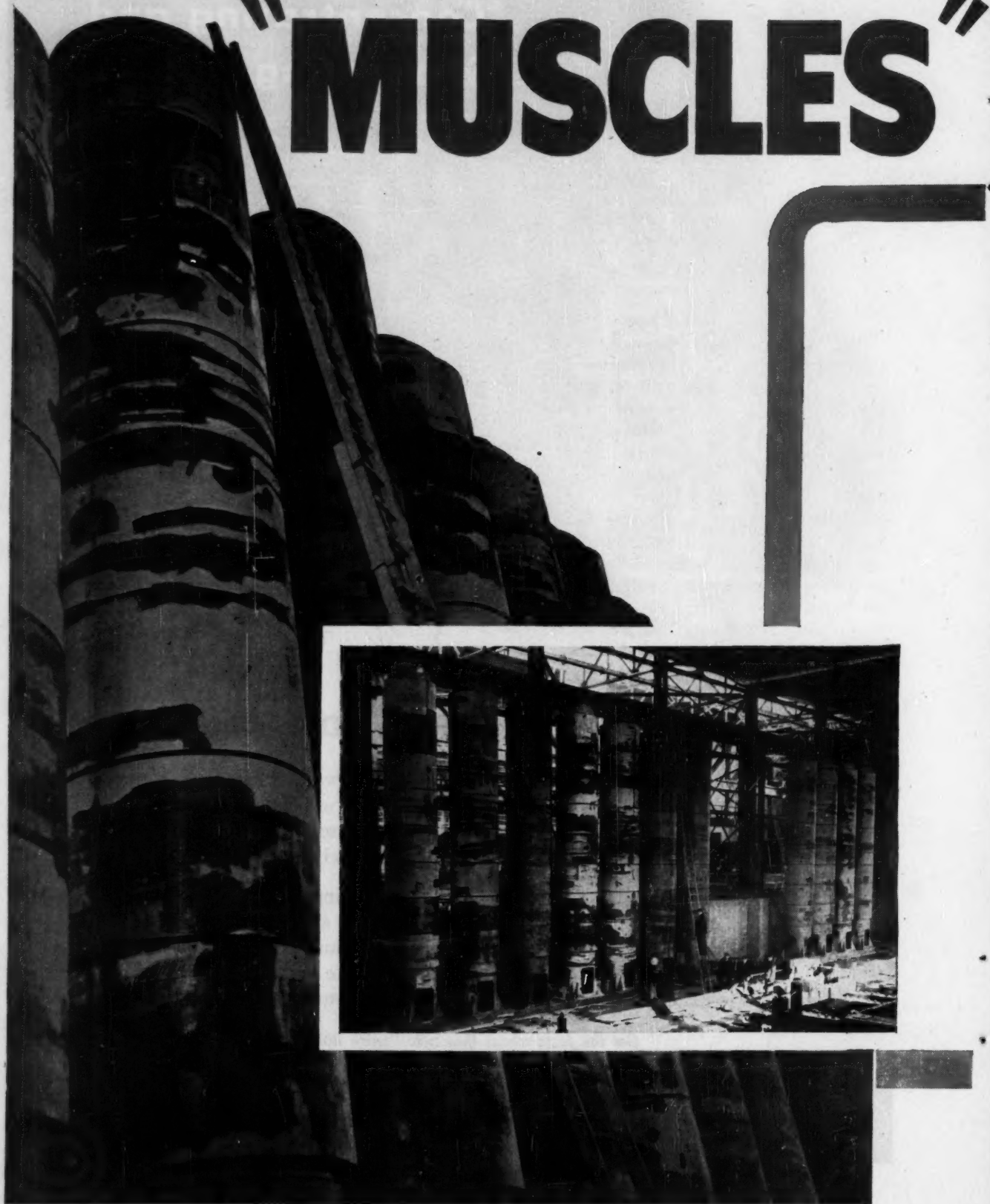


SHARPLES

THE SHARPLES CORPORATION
2300 WESTMORELAND STREET • PHILADELPHIA 40, PENNSYLVANIA
NEW YORK • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • NEW ORLEANS • SEATTLE • LOS ANGELES • SAN FRANCISCO • HOUSTON
Associated Companies and Representatives throughout the World

B&W Banded Bottles . . .
to store the

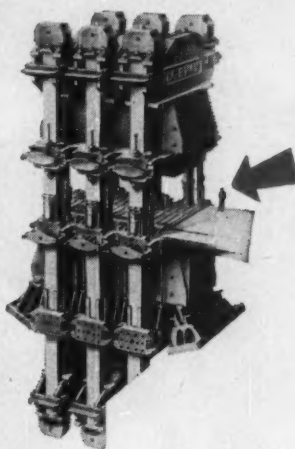
"MUSCLES"



for the **WORLD'S MIGHTIEST PRESS**

Between strokes of this mammoth press, these seven huge B&W Accumulators will hold in check the tremendous hydraulic force—water at a pressure of 4500 psi—required to operate the largest, heaviest, most powerful production tool in the world. It is a 50,000-ton, ten-story-high, die-forging press built by Loewy-Hydropress, Inc., and now being erected at the Wyman-Gordon plant near Worcester, Massachusetts, for the United States Air Force. When completed it will be perhaps the most effective tool yet designed to aid democracy's defense. And alongside this unit, a 35,000-ton press—to be served by the four additional B&W Accumulator Bottles shown—is also being erected for the USAF.

For high pressure such as this—in the range between 2000 and 6000 psi—B&W Banded Pressure Vessels have a measurable advantage over conventionally constructed vessels. The inner shell—in this instance consisting of 4-inch-thick plate—is fabricated in accordance with ASME Code requirements to withstand longitudinal pressure loading. And to reinforce that shell circumferentially, a seven-inch-thick layer of steel bands is wrapped around it, enabling each accumulator to contain safely, the pressure of the hydraulic fluid.

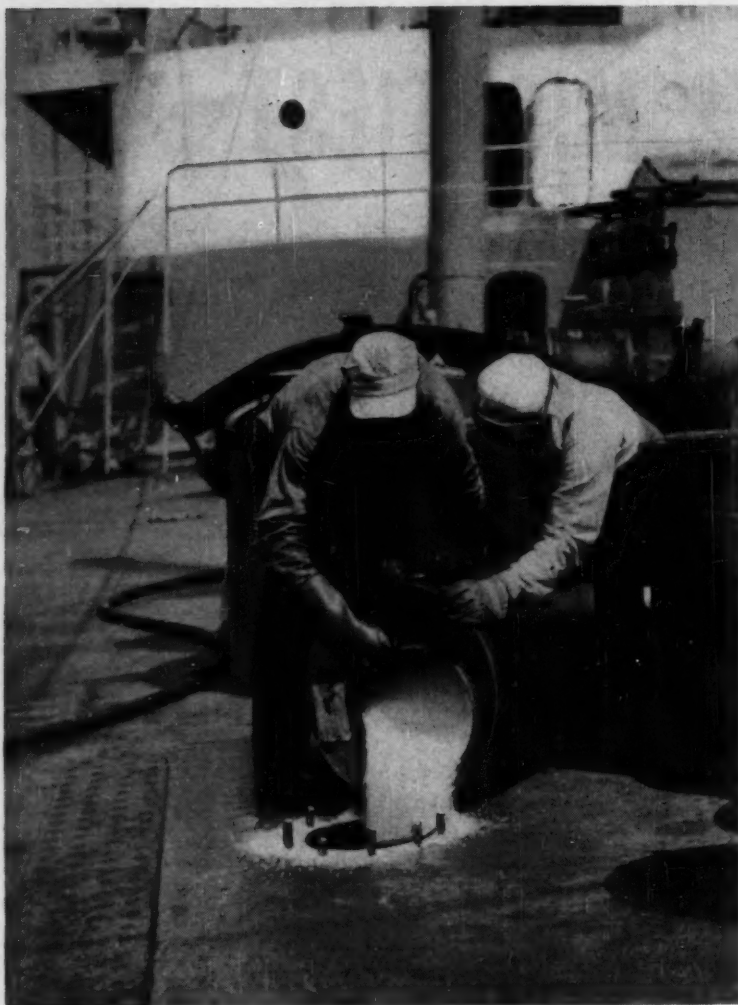


As with these specific bottles, uncompromising care and the most advanced techniques go into the fabrication of every B&W Pressure Vessel. Each production step is performed on equipment designed specially for its job. Much of this equipment as well as many types of construction used, are original B&W developments.

Whatever your operations may be, if they require accumulators capable of withstanding working pressures somewhere between 500 and 6000 psi, with capacities ranging from 5 gallons to 10,000 gallons, it will pay you to get the facts about B&W Pressure Vessels. The Babcock & Wilcox Company, Process Equipment Dept., Barberton, Ohio.

**BABCOCK
& WILCOX**





SODIUM NITRITE rustproofs oil tanker's hold—one of its new jobs as a . . .

Resurgent Corrosion Fighter

Solvay reexamines sodium nitrite's properties as a corrosion inhibitor, boosts sales for that use many fold in less than five years.

One of sodium nitrite's minor outlets—corrosion inhibition—has mounted surprisingly of late. Sales are way up for Solvay Chemical as industry gives the chemical ever-widening play as a semipermanent,

rust-resistant, film-former for iron and steel* in neutral or alkaline mediums.

* Although used mostly with iron and steel, sodium nitrite will, it's reported, suppress corrosion of aluminum, tin, Monel, copper and brass.

Sodium nitrite, for example, prevents corrosion in circulating water systems, water base paints, stored oil products, metal containers, metal cutting and grinding compounds. In combination with caustic soda it both protects and cleans oil product pipelines and tanks in light oil service. Caustic NO_2 mixtures provide one-step treatment—neutralization and rustproofing—of machined parts coming from acid pickling baths.

Where more than temporary protection is in order—equipment exposed to high humidity or rainfall for limited periods—combinations of sodium nitrite with sodium phosphate fill the bill. For these very new and perhaps most promising combines of all give coatings that are thirty times more resistant to water washing.*

Let's look closer now at sodium nitrite's newly won territory.

- **Circulating water systems:** 0.02-0.10% of the nitrite keeps spray cooling, air conditioning and diesel heat exchanger systems rust-free.

- **Petroleum industry:** Virtually insoluble in oil, sodium nitrite dissolves only in the small traces of corrosion-causing water entrained in stored petroleum products. Since as little as 200 ppm. NaNO_2 in water is effective against corrosion, large volumes of oil products can be safely stored at small cost in inhibitor. Nitrox—a fused mixture of NaNO_2 and NaOH —cuts maintenance costs (in between hauls) on seagoing tankers in light oil service. A 5% solution of Nitrox sprayed on the bulkheads of empty tanks cleans and protects them in one treatment.

- **Metals in process:** Spraying or dipping metal parts with a 3-5% water solution of sodium nitrite shields them during brief storage or between processing steps. Longer storage periods under wet conditions call for protection by nitrite-phosphate films. And so—

* Nitrite-phosphate coatings consist of a thin film of gamma iron oxide reinforced by iron phosphate.



"Honeycombed" with air spaces...

Celite Diatomite Powders Magnified 250 X

Celite Powders provide bulking action

3 to 10 times greater than any other inert mineral filler

POUND FOR POUND, Celite* diatomite powders supply more bulking action than any other inert mineral filler because their cubic volume is 3 to 10 times greater. Celite's unique "honeycombed" structure is composed of microscopic, irregularly shaped particles that won't pack down. In mass they weigh only about 10 lbs. per cubic foot.

That's why Celite is so widely used to add bulk and body to industrial formulations. For example, it extends

white pigments in paints and papers . . . it improves dispersion of insecticides and fertilizers . . . it fluffs up dry powders such as household cleansers.

Also, from Celite's "honeycombed" structure comes its great absorptive capacity. This characteristic is profitably utilized to keep powders free-flowing . . . to provide a medium for shipping or storing liquids in dry form. And because of the physical structure of its individual particles, Celite has become the outstanding

flattening agent for paints . . . it serves as a mild, non-scratching abrasive for fine polishes . . . it improves the surface appearance of plastics.

Which of the many Celite advantages can you use to build product performance or cut costs? A Johns-Manville Celite Engineer will gladly discuss your problem, without obligation. For his services or more information, write Johns-Manville, Box 60, New York 16, New York. In Canada, 199 Bay St., Toronto 1, Ontario.

*Celite is Johns-Manville's registered Trade Mark for its diatomaceous silica products.



Johns-Manville CELITE

INDUSTRY'S MOST
VERSATILE MINERAL FILLER

Products on these pages this month made news . . .

Page number is also Reader Service code number	
Sodium nitrite fights corrosion.....	140A
More waste paper reclaimed.....	142A
Hydrazine treatment for boiler water.....	144A
Stronger boxboard from wheat straw.....	144B
Vinyl topcoats for stored tools.....	144C
Catalyst ups NH_3 synthesis gas rates.....	146A
Nucleic acid derived from yeast.....	146B
Engineering plastic.....	146C
Easier disposal of radioactive wastes.....	148A
Spotlight on rhenium.....	148B
Animal nutrition factor.....	148C
Long-lived radioactive aluminum.....	148D
New strength for silicone rubber.....	148E
Fire-retarding paint additive.....	148F
ACTH synthesis a little closer.....	148G
Surfactant covers stored liquids.....	148H

. . . For more about any item, use Reader Service

dium nitrite films, unlike soluble oils and slushing compounds which require later rinsing, afford clean surfaces for handling and machining.

- **Boiler feed water:** By oxidizing magnetic oxide to ferric oxide, 200 ppm. concentrations of sodium nitrite repress the iron deposition that often causes boiler tube failure.

- **Metal shipping containers:** Aqueous NaNO_2 solutions—3 to 5%—rustproof the interiors of freshly cleaned steel drums for several months. Producers of alkaline cleaners, detergents and liquid waxes use the nitrite in their formulations to guard against corrosion of the steel containers which package them.

- **Cutting oils:** Small amounts of sodium nitrite in emulsifiable cutting oils prevent rusting of steel products undergoing machining.

- **Metal treatment before and during enameling:** Added to the frit before milling, or directly to the slip, sodium nitrite concentrations as low as 0.01-0.05% eliminate rusting of base metal, avoid the mottled effect so common to old time enamel ware.

All this testimony serves to point up how an old chemical has caught new industrial fancy. But NaNO_2 's comeback as a corrosion fighter never would have come off at all without a reappraisal, first, of its properties.

Solvay, one of the country's two

top producers of sodium nitrite (Du Pont is the other), started pushing the needed reappraisal in 1948. They pushed it because their longstanding nitrite markets—like so many longstanding markets—were proving to be far from captive;* the near-exhilarating postwar atmosphere seemed to foster any sort of regrouping or expansion.

► **Strike**—It wasn't entirely by chance that the nitrite researchers struck richest paydirt in an old claim—corrosion inhibition. There were a few clues pointing where to dig.

Solvay knew, for example, that steel equipment and materials used in sodium nitrite's manufacture keep remarkably rust-free, knew of twenty-year-old patents awarded for use of NaNO_2 in auto anti-freeze compounds. There was some spotty literature, too, which testified that the nitrite forms tightly adhering, semipermanent oxide coatings on metallic surfaces.

By carefully sifting this known data, tying loose pieces of information together, and throwing in an intensive development effort of their own, Solvay made industry more fully aware of the nitrite's corrosion combating potential. In less than five years its market as an inhibitor bounded from a minor

position (use in anti-freeze) to a place beside Solvay's big volume outlets for the chemical.

If you're looking for a moral to the story, there is one. It poses a question to any chemical processor: Why not give your old products the onceover? **140A**



Waste Paper Reclaimed

Resin adhesive that's soluble in deinking solutions permits easy reuse of waste paper.

Manufacturers of paper products can now use resin adhesives in processing and still get premium prices from paper mills for returned production cutting (see cut). And, as a corollary to this, mills which have been reluctant to reprocess

* Two major markets had paled somewhat: color fixation in meats and azo dyeing of textiles. Some agents, ascorbic acid for one, enable more efficient (and more sparing) use of NaNO_2 in meat coloring. Textiles, in general, were in the doldrums.

ONLY CARBIDE PRODUCES ALL THREE

You can order any one or all three of these low-boiling alcohols from CARBIDE. They are available in various specification grades to suit your requirements. CARBIDE's 25 years of experience in producing synthetic alcohols assures you of high-purity products. Tank-car and tank-truck shipments are readily made. Prompt LCL deliveries of most grades can be made from 50 warehouses in important industrial areas.

WHENEVER YOU NEED AN ALCOHOL...

... check with CARBIDE — producers of 16 other synthetic alcohols. From this wide choice, you will be able to select the alcohol that has the combination of physical properties to solve your problem.

For Technical Assistance

Call the nearest CARBIDE office for technical service — representatives are located in 21 principal cities across the nation. For additional information on these alcohols — their applications, physical and chemical properties, specifications and shipping data — ask for the new family book, "Alcohols" (F-4731). In Canada: Carbide Chemicals Sales Company, Division of Union Carbide Canada Limited, Toronto.

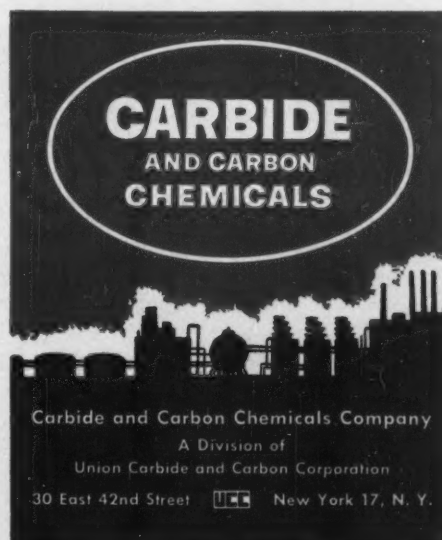
methanol

ethanol

isopropanol

These alcohols are most widely used as solvents and intermediates for —

- * Surface Coatings
- * Resins
- * Dyestuffs
- * Pharmaceuticals
- * Cosmetics



CHEMICALS & RAW MATERIALS . . .

waste paper containing insoluble resin adhesives can now conveniently utilize a large source of paper raw material.

Reason: Resyn 60R-3132, a polyvinyl acetate emulsion soluble in alkaline deinking solutions used by paper mills.

Earlier resin adhesives while boasting production advantages—high speed, strength, resistance to moisture and heat—did not dissolve in alkaline deinking processes. Instead they would show up as unsightly, hard-to-print-on spots in finished paper from such repulped stock. Scrap losses for the paper converter and raw material losses for the paper maker were inevitable results.—National Adhesives Division, National Starch Products Inc., New York, N. Y. 142A

Hydrazine vs. Corrosion

More and more power stations are using it as an oxygen scavenger for boiler feed water.

In 1951, one steam station; in 1954, nine stations. That's the progress report for boiler feedwater treatment with hydrazine hydrate in this country. Reasons for slow but sure progress in the face of heavy inertia are several, and due mostly to limitations of other reducing agents:

- Hydrazine doesn't interfere with pH control of boiler water. Unlike sodium sulfite and other reducing chemicals, its decomposition products are not corrosive acids. Hydrazine in properly controlled concentrations, in fact, decomposes partially to ammonia, thus maintains a beneficial alkaline pH throughout the system, cuts down corrosion due to dissolved CO_2 . And residual hydrazine in the water protects boilers against occasional increases in dissolved oxygen caused by variable operating conditions.

- Hydrazine compounds don't add to total dissolved solids in boiler water (they decompose to N_2 and water . . . or to ammonia).

- Hydrazine treatment is no more expensive. Quantities needed are so small as to offset initial

higher cost of the chemical (e.g. 6.2¢ per million pounds of feedwater treated compared to 8.5¢ for sodium sulfite).

- Handling is safe. Hydrazine hydrate as a 35% solution emits no corrosive fumes, has no flash point at room temperature in an open container, is less objectionable than, for instance, NH_4OH or some volatile amines. A 35% solution isn't corrosive to iron and steel, requires no greater care in handling than many other water conditioners.—Olin Mathieson Corp., Baltimore 3, Md. 144A

Corrugating Medium

For the first time: top-quality paperboard from an annual crop fiber—wheat straw.

Corrugated board, the backbone of any box, serves virtually all industry. Expanding mightily to meet the increasing demands of that industry, boxboard manufacturers have become increasingly concerned

over an eventual shortage of the fibrous raw material from which the best paperboard is made—wood pulp.

A tree's long growth cycle, controlled cutting of timber and the swelling volume of newsprint and other paper consumed each year are all factors leading to just such a woodpulp shortage for boxboard makers.

Now, however, a development announced by Alton Box Board may assure an adequate and enduring raw material supply. Alton says it has utilized wheat straw, an abundant annual crop fiber, to produce a high-quality paperboard called Cor-U-Cel with a crush resistance 20% greater than any other corrugating medium regardless of the fiber source.

Wheat straw has long been known to possess the inherent sturdiness to make top notch paperboard. A stalk of wheat has far, far greater strength, greater ability to resist crushing, than a sliver of wood of equal thickness. Pentosans, the substances which bind raw



Vinyl Topcoats for Machine Tools in Storage

Exhaustive testing by Ryan Aeronautical Co. shows that vinyl-base coatings for exterior-stored machine tools provide longer-lasting protection than the old grease system. In the photo a workman is spraying the

preservative on a C-124 jig to be stored outside. Ryan tests claim resistance of vinyl coatings ranges from 55 to 160 hr. of salt spray.—Ryan Aeronautical Co., San Diego, Calif. 144B

ETHYL ALCOHOL 2-AMINO-2-METHYL-1,3-PROPANEDIOL

BUTYL STEARATE DIBUTYL PHTHALATE

BUTYL LACTATE NITROPARAFFINS AMMONIA

AMYL ACETATE BUTYL ACETATE

RIBOFLAVIN, USP

NP DERIVATIVES

BUTANOL

DIMETHYLAMINE

ACETONE

1-NITROPROPANE

2-NITROPROPANE

FORMALDEHYDE

NITROETHANE

ALKATERGE®

NITROMETHANE

HYDROXYLAMMONIUM SULFATE

PENTAERYTHRITOL

MONOMETHYLAMINE

METHANOL

ETHYL ACETATE

TRIBUTYL PHOSPHATE

DIETHYL OXALATE

2-AMINO-2-METHYL-1-PROPANOL

TRIMETHYLAMINE

HYDROXYLAMMONIUM CHLORIDE

HYDROXYLAMMONIUM ACID SULFATE

BENZYLTRIMETHYLAMMONIUM CHLORIDE

CSC supplies American industry with 35 basic chemicals

CSC PETROCHEMISTRY—that industrial magic that creates essential chemical tools from natural gas, petroleum products, and air has a worthy partner in CSC's BIOCHEMICAL operations. Together they form the strong foundation for CSC's diversified output of several hundred important chemicals which feed the growing giant—American industry.

With its new, modern plants, warehouses, sales offices, and shipping points pinpointing the land

from coast to coast, and north to south, CSC is your headquarters for basic chemicals vital to industry's processes and progress. For the right product, at the right price, and at the right time, specify CSC! CSC's market development technical service, backed by years of pioneering experience, is a highly valued extra! Write today for complete Products Catalog. Industrial Chemicals Sales Department, Commercial Solvents Corporation, 260 Madison Avenue, New York 16, New York.

COMMERCIAL SOLVENTS
CORPORATION



straw fibers together and re-cement finished paperboard fibers, are the key to wheat straw's durability; it contains more pentosans than any other practical source of fiber, including wood. But wood pentosans are harder, can better resist the wasting, leaching action of the age-old pulping and refining processes, and consequently carry through in better shape, give stronger finished paperboard finally than does wheat straw.

Alton Box Board has successfully revamped this cooking technique, has preserved the high pentosan content of wheat straw. The result: Cor-U-Cel, "the finest corrugating medium in the industry".—Alton Box Board Co., Alton, Ill. 144C

More Ammonia

Nickel catalyst gives higher ammonia synthesis gas rates.

Girdler's new nickel base catalyst, G-29, gives 25% greater production capacity for ammonia synthesis gas from natural gas by steam-reforming. And should you use production rates obtainable with older catalysts, G-29 will work at top efficiency at lower reaction temperatures (100 F. lower), will save process fuel costs.

Other uses: production of controlled atmospheres and carrier and fuel gas; dissociation of ammonia.

G-29 is approximately 27% nickel, becomes active in reforming hydrocarbons at 1,100-1,850 F. shrinkage below 1,850 F. is less than 5%.—Girdler Co., Louisville 1, Ky. 146A

Nucleic Acid From Yeast

Successful production from new and plentiful source—yeast grown in sulfite liquor.

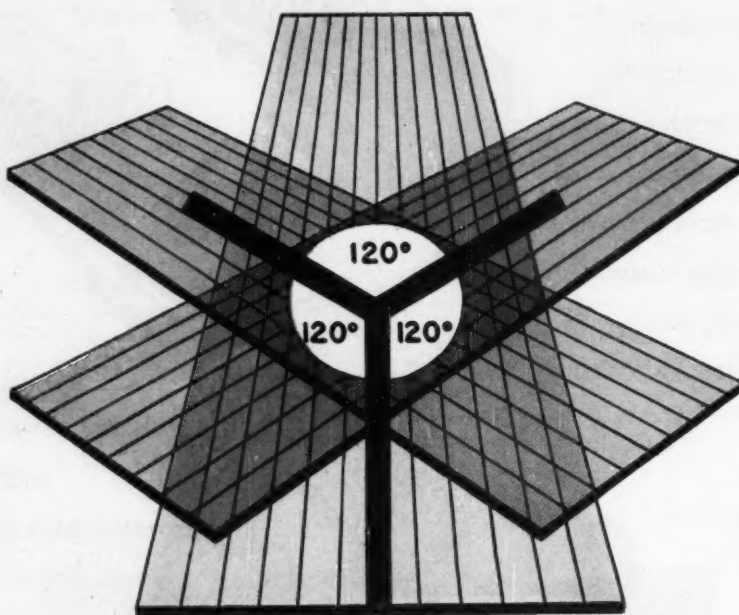
Nucleic acid—essential to growth and proper function of living cells is available now in quantity for greatly expanded investigation and treatment of disease and nutritional deficiencies.

Joint development work by

Schwarz Labs and Rhineland Paper Co. of Wisconsin has led to volume recovery of the acid from *Torula* yeast which is cultivated in spent sulfite liquor from Rhineland's paper mill. Both companies are working, too, on methods for isolating from the yeast other biochemicals invaluable to medical research.

Some of the compounds derived

from or related to nucleic acid: Adenosine, which extends the storage life of whole blood; Adenosine triphosphate, a powerful heart stimulant; Adenosine-5-phosphoric acid which dilates blood vessels and aids the treatment of peripheral vascular disease, bursitis, arteriosclerosis.—Schwarz Laboratories, Inc., Mount Vernon, N. Y. 146B



Equal Strength in All Directions

Elimination of handwork in production of plastic members and uniformity of properties are twin features of Scotchply reinforced plastic. Scotchply consists of one or more epoxy or polyester plastic sheets reinforced with lineally aligned glass filaments. The sheets are bonded together to obtain either a directional or an isotropic—equal strength in all directions—strength pattern. Diagram above shows three Scotchply pre-impregnated sheets laminated together at 120 degree angles to give all over strength in the laminating plane.

Because it's uncured (hence more

moldable) at point of sale, Scotchply can be readily formed by mass production methods—drawing, stamping, etc.—and then hardened or cured by heat and light pressure.

Current pilot plant production is about 30,000 lb. a month. Initial full capacity expected: 1,000,000 lb. a month.

Introductory price: (for highest strength grades): \$1.90 to \$2 a lb. depending on quantity.

Forms: thin, narrow unidirectional tapes to larger coiled or flat isotropic sheets of almost any thickness.—Minnesota Mining and Mfg. Co., St. Paul, Minn. 146C

Here are the Facts!



This new book on
SOLVAY®
SESQUICARBONATE
of SODA contains detailed
 information on the physical
 and chemical properties
 now being utilized to:

1. Improve Products or Processing!
2. Reduce Manufacturing Costs!

SOLVAY'S two forms of sesquicarbonate of soda—Snowflake Crystals and Snowfine have a distinctive combination of both physical and chemical properties not found in any other form of alkali. Their uses range from that of important ingredients in the manufacture of luxury cosmetic products . . . to their application in a variety of basic industrial processes.

We will be glad to send you a copy of this new booklet without cost or obligation. In addition, if you will write, giving us details of your operation, we will be glad to tell you how SOLVAY Sesquicarbonate of Soda can be used to the best advantage . . . and send samples, too.



Snowflake Crystals
Snowfine®

SOLVAY PROCESS DIVISION

ALLIED CHEMICAL & DYE CORPORATION
 61 Broadway, New York 6, N. Y.



BRANCH SALES OFFICES:
 Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit
 Houston • New Orleans • New York • Philadelphia • Pittsburgh
 St. Louis • Syracuse

MAIL COUPON NOW • and get all the facts!

SOLVAY PROCESS DIVISION

ALLIED CHEMICAL & DYE CORPORATION

61 Broadway, New York 6, N. Y.

Gentlemen: Without cost or obligation send me:

- ☐ Samples of SOLVAY Sesquicarbonate of Soda
- ☐ Your new book on Sesquicarbonate of Soda
- ☐ Information on how Sesquicarbonate of Soda may be used in my operation. See attached details on my Company letterhead.

Name _____

Company _____

Title _____

Address _____

City _____ Zone _____ State _____ AK-2

Soda Ash • Snowflake® Crystals • Potassium Carbonate • Chlorine • Ammonium Bicarbonate
 Calcium Chloride • Sodium Bicarbonate • Cleaning Compounds • Caustic Potash • Chloroform
 Sodium Nitrite • Caustic Soda • Ammonium Chloride • Methylene Chloride • Methyl Chloride
 Carbon Tetrachloride • Monochlorobenzene • Para-dichlorobenzene • Ortho-dichlorobenzene

Ultimate Disposal

Absorption of radioactive wastes in clay brightens outlook for commercial atomic power.

An extruded montmorillonite clay absorbs a wide variety of high-level fission products, defies leaching and provides permanent, disposal for rapidly accumulating radioactive wastes.

Especially important is this to the growth of a successful atomic power industry, an industry which cannot compete with conventionally generated electricity if it must bear the AEC's present waste disposal expenses.

Costs now run from 35¢ to \$2 a gal. for tank storage and must provide, as well, for frequent monitoring of storage systems against leaks. And there's always the long term hazard that some fission products will still be hot when metal tanks have corroded.

But monmorillonite clay in extruded form absorbs radioactivity from circulating liquid atomic wastes and, when baked at 800-1000 C., forms hard ceramic beads from which the hot material can't be leached. Thus captured, radioactive wastes could be buried at sea or even in the ground with assurance of insignificant release to the environment.—Brookhaven National Laboratory, Upton, N. Y.

148A

Spotlight on Rhenium

Increased availability plus unusual characteristics bring metal from obscurity to commercial attention.

Ten to twenty thousand pounds of rhenium—enough, it's believed, to meet potential future demands—

can be made available to industry. The metal may, in fact, soon see service in electrical contacts, electron tube materials, high temperature thermocouples, and high wear resistance parts.

While it's true rhenium will be expensive its properties may justify use in highly specialized electrical and electronic applications:

- Rhenium has the second highest melting point of all metals (3,180 C.) . . . has very high

strength at all temperatures.

- Ductile at low temperatures, rhenium work hardens more than any other pure metal.

- Unlike tungsten, rhenium doesn't have a water cycle, the phenomenon which blackens lamps and causes filaments to fail.

- Rhenium's conducting oxide performs outstandingly, it's said, in certain electrical contacting.—Battelle Memorial Institute, Columbus 1, Ohio.

148B

Product Briefs

Diethylstilbestrol—a synthetic hormone with a 13-year history of human use—promises to have an impact on animal nutrition comparable to antibiotics. Added at Iowa State College to cattle feeds in an FDA-approved premix form, called Stilbosol, diethylstilbestrol boosts average daily gain of fattening cattle by 19%, cuts feed costs by 11%. Put another way, Stilbosol produced good to choice beef for as little as 18.3¢ a lb. and swelled profit margin as much as \$21.90 per steer.—Eli Lilly and Co., Indianapolis 6, Ind.

148C

A long-lived radioactive aluminum isotope is available for tracer experiments. Last of the chemical elements to spawn a radioactive isotope, aluminum—its compounds, its fabrication—can now be better studied.—Carnegie Institute of Technology, Pittsburgh 13, Pa.

148D

Silicone rubber with the strength of other rubbers is the claim for Cohrlastic HT. New reinforcing fillers (probably estersil silicas) give this rubber tensile strengths ranging from 1,000 to 2,000 psi. and tear strengths of 200-300 lb. per linear inch, compared to 800-900 psi. and 100 lb. per linear inch for earlier silicone rubbers.—Connecticut Hard Rubber Co., New Haven, Conn.

148E

A fire-retardant borate additive, FR-28, is ticketed for use in latex paints used for fibrous wall

board and like surfaces. FR-28 is believed superior to commonly used combinations of borax and boric acid or other borate mixtures. It provides, in addition to the safety factor, improved paint washability and corrects the problem of borate recrystallization in paint films.—Pacific Coast Borax Co., New York 17, N. Y.

148F

Fractionation of the immensely complex ACTH molecule and analysis of its most abundant component bring commercial synthesis of the hormone from the realm of the inconceivable to that of the possible. Restrained optimism is specifically based on the concurrent discovery that all eight ACTH fractions are equally active, all perform therapeutically as does the parent compound. This leads to the hope that further fractionation will give components small enough and simple enough to be within the scope of chemical synthesis and at the same time still show physiological activity.—American Cyanamid Co., New York 20, N. Y.

148G

Fluorocarbon surfactants can reduce fire hazards, evaporation losses and air pollution in the oil industry. These agents form an extremely thin film on the surface of stored petroleum products, are effective in concentrations as low as 0.002% by weight of gasoline.—Minnesota Mining & Manufacturing Co., St. Paul, Minn.

148H

For More Information . . .



about any item in this department, circle its code number on the Reader Service

Postcard inside the back cover.

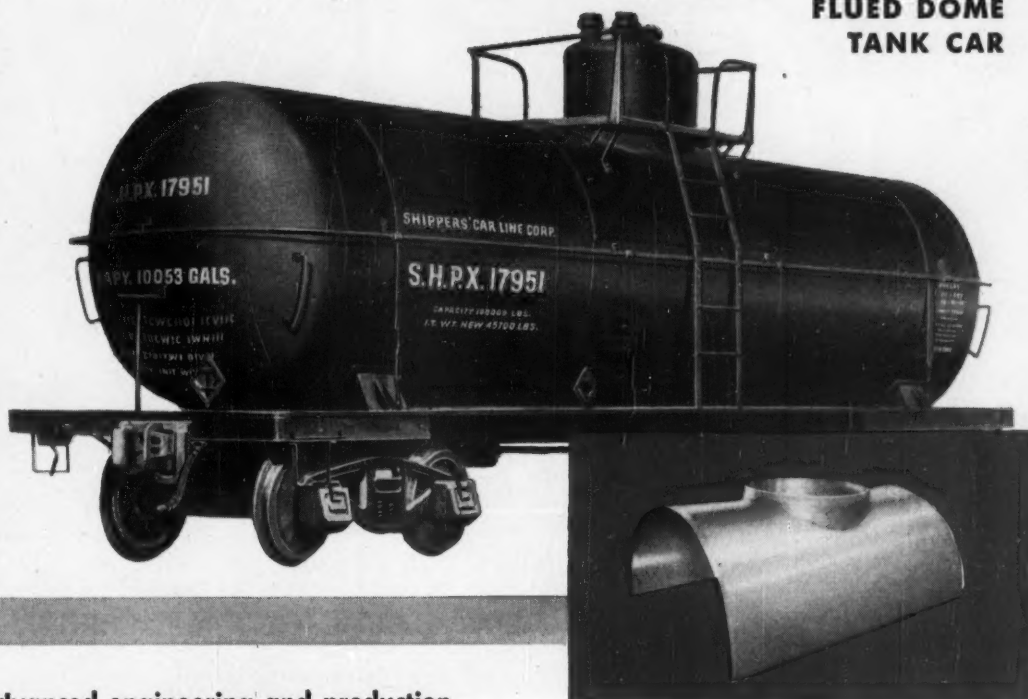
New concept in tank cars

QCF

BUILT

DURADOME

**FLUED DOME
TANK CAR**



Advanced engineering and production know-how make this truly modern tank car available at no extra cost.

Top center section, showing flued dome base

- A million-dollar press actually *flues* the dome base out of the heavy center section—providing greater strength and a smooth interior for easier cleaning . . . better application of lining.
- Superior *pressure-type* tank construction (complete ring sections) means heavier steel *all* the way around for greater durability.
- *Standardized* all-welded underframe provides flexibility of use with tanks of all standard types and capacities . . . more economical maintenance.
- *All-welded* insulation jacket (when insulation is required). Streamlined . . . more weatherproof . . . easier to keep clean . . . needs less maintenance.

The DURADOME car is available for lease or sale through . . .



SHIPPERS' CAR LINE CORPORATION

30 Church Street, New York 7, N. Y.

A subsidiary of QCF INDUSTRIES Incorporated

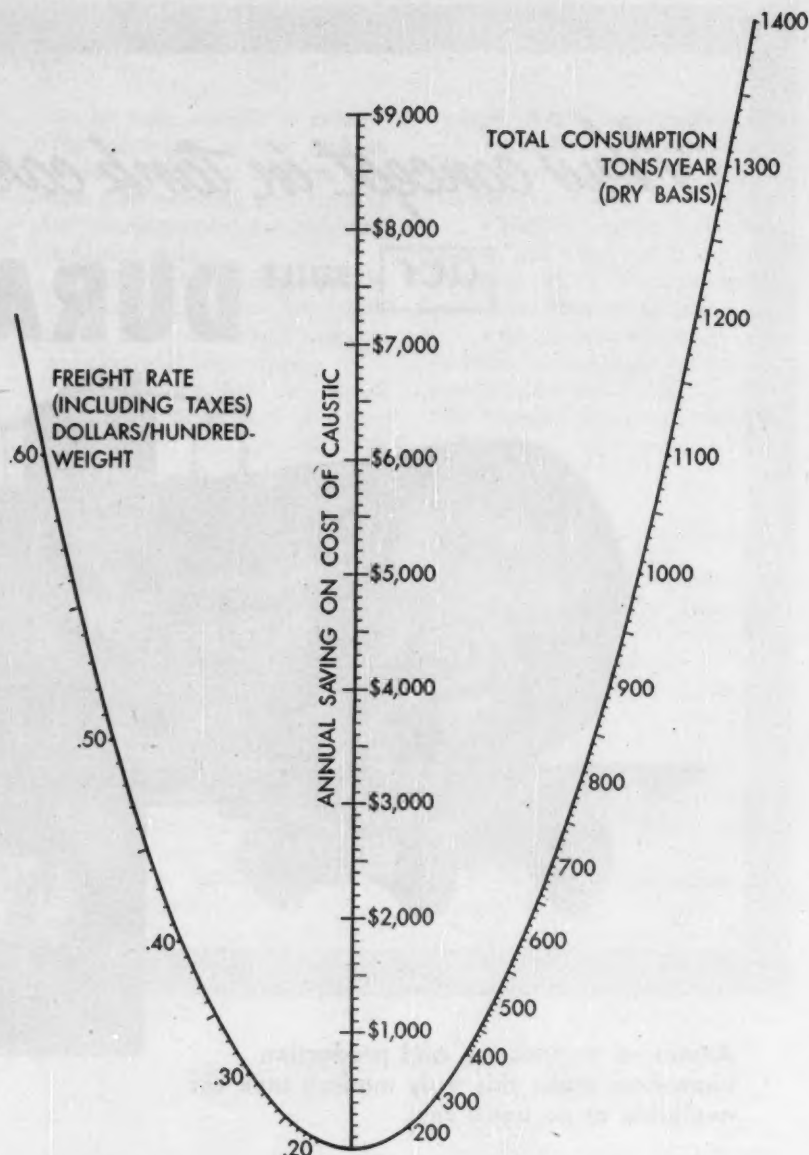
CHICAGO, ILL. • HOUSTON, TEX. • SAN FRANCISCO, CAL. • MILTON, PA. • EAST ST. LOUIS, ILL. • SMACKOVER, ARK. • TULSA, OKLA. • NORTH KANSAS CITY, MO.

Which saves you more... 50% or 73% Caustic Soda?

This nomograph can help you decide Are you using the caustic solution that's least expensive for you? A few seconds' calculation with this nomograph will help you decide.

How to find if you can save on 73% caustic soda Simply draw a line from your freight rate (including taxes) to your annual consumption in tons on a dry basis. Your approximate savings will appear where this line intersects the center line of the nomograph.

This figure represents your savings



on freight charges after the \$2.00 premium price on 73% caustic soda has been deducted.

From this figure you must deduct a depreciation charge based on the cost of dilution equipment. Your Hooker technical service man is ready to advise you on the equipment needed and its cost.

Double-check your findings this way Before you make a final decision on 50% or 73%, give yourself the advantage of expert technical advice. Let your Hooker technical service man

show you what equipment you will need for 73%. He will figure your exact savings—based on a realistic study of your operations.

For quick service, write or phone the nearest Hooker office.



"CAUSTIC SODA BUYER'S GUIDE" is the title of a new pocket-size booklet we'll be glad to send you free. Contains helpful facts on the economics of 50% and 73% solutions; other forms of caustic soda; capacities of tank cars and other containers; useful shipping information. Write us for a copy.



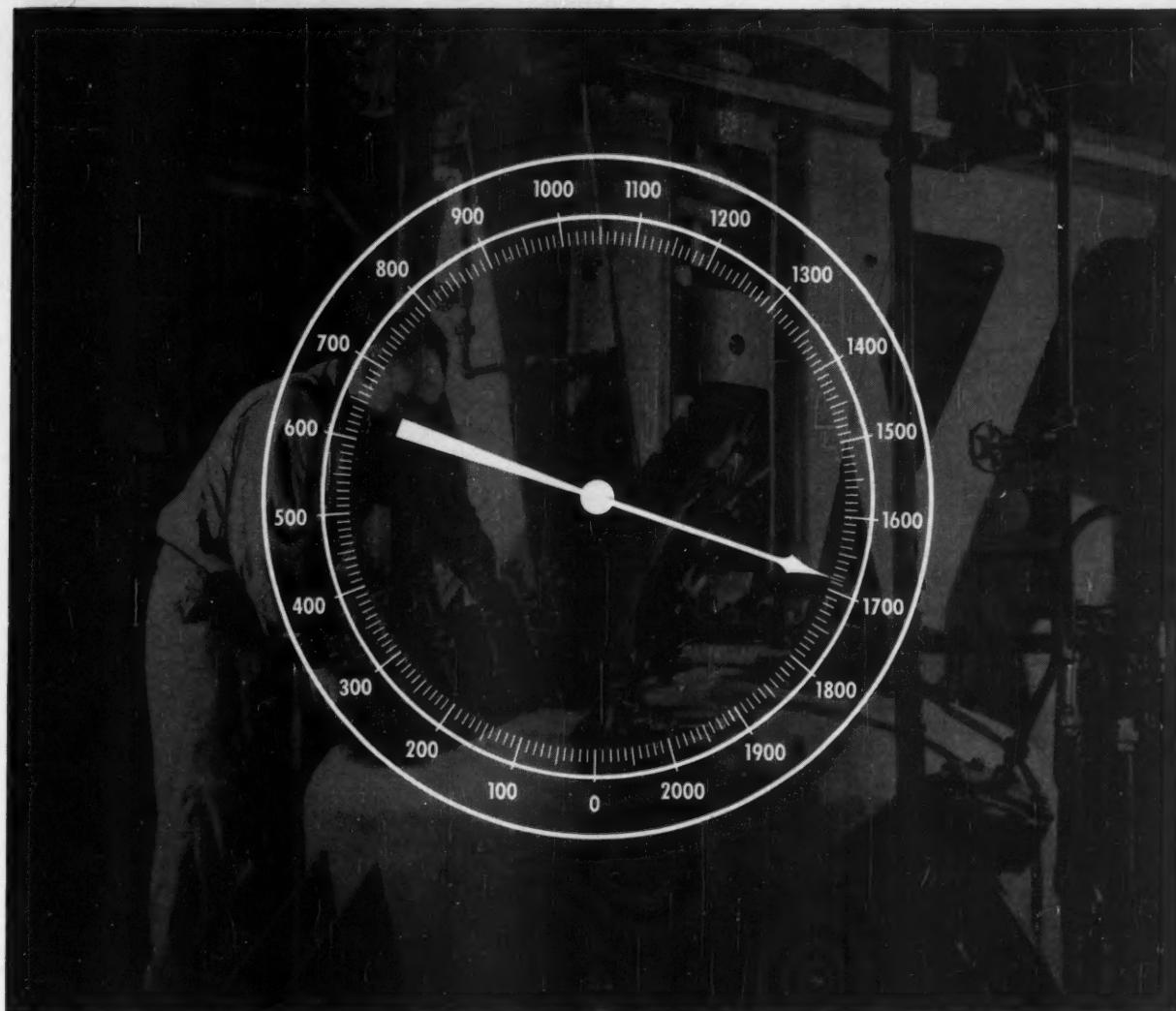
1905—Half a Century of Chemicals

From the Salt of the Earth—1955

HOOKER ELECTROCHEMICAL COMPANY

5 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.

NIAGARA FALLS • TACOMA • MONTAGUE, MICH. • NEW YORK • CHICAGO • LOS ANGELES



processing pressures versus operating safety

The trend in processing is moving towards higher temperatures and pressures. With it, the hazards of operating equipment are rapidly increasing.

Each of us—you as a processor, we as manufacturers of equipment—has a share in the responsibility for operating safety.

For fabricators of pressure vessels, the A.S.M.E. Code provides excellent rules and procedures which have, as a fundamental objective, safe operation. Here at Blaw-Knox, they are strictly adhered to, but as a *minimum standard*.

Into your Autoclave-Reactor, we design and build the maximum margin of safety permitted by the limitations of the job. The latest construction materials . . . new methods of stress analysis . . . recent developments in fabricating . . . the latest accepted principles of design—all contribute to operating safety. All are given careful consideration at Blaw-Knox.

Your Blaw-Knox Autoclave-Reactor is twice inspected at each stage of its completion. From initial design to final testing, it is carefully examined first by experienced Blaw-Knox Inspectors. Next, it is thoroughly re-examined by a fulltime Hartford Insurance Inspector hired to assure you of receiving a vessel which will be insured by any company.

These are important factors to consider when specifying an Autoclave-Reactor. They are the factors that make Blaw-Knox Autoclave-Reactors more reliable. When you buy, be sure to specify Blaw-Knox.

Write for Blaw-Knox Catalog No. 2413

BUFLOVAK EQUIPMENT DIVISION

BLAW-KNOX COMPANY



1551 Fillmore Avenue
Buffalo 11, New York

reach a new peak in spraying efficiency with YARWAY non-clog nozzles

cone spray

Most popular design for cooling, recooling, washing, rinsing, air conditioning, drying and other spraying operations in industrial and processing work and in power plants.

Non-clog involute design has no internal parts (vanes or deflecting plates) on which foreign particles can collect. Special contour of nozzle body guides flow with minimum loss of energy towards discharge opening, where liquid attains maximum velocity and leaves nozzle in a fine hollow-cone spray.

Available in three types:

Bar-stock bronze (shown) for fine spray
Sizes $\frac{1}{4}$ " and $\frac{3}{8}$ ", male or female connection
Capacities up to 3 gpm; pressures 20 to 50 psi

Cast bronze Type B (shown) for air conditioning and small recooling systems
Five sizes, $\frac{1}{2}$ " to $1\frac{1}{2}$ "
Capacities up to 40 gpm; pressures 7 to 25 psi

Cast bronze Type C (not shown) for spray pond service
Sizes 2" and $2\frac{1}{2}$ "
Capacities up to 110 gpm; pressures 7 to 15 psi

Write for YARWAY Spray Nozzle Book N-617; it gives capacities, dimensions and application information.

fan spray

Preferred for many washing and cooling operations. Non-clog design, delivers flat fan-shaped sheet of spray with slicing action particularly desirable for surface washing.

Thin sheet of spray is discharged forward 30° from the vertical, spreading in fan shape up to 140° , depending on operating pressure.

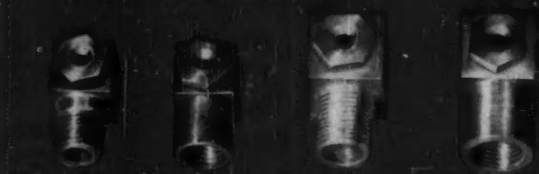
Made of bronze, steel or other bar-stock metals, male thread, six sizes $\frac{1}{8}$ " to 1", capacities up to 7 gpm, pressures up to 50 psi.

Write for YARWAY Spray Nozzle Book N-617.

YARNALL-WARING COMPANY

137 Mermaid Avenue, Philadelphia 18, Pa.

BRANCH OFFICES IN PRINCIPAL CITIES



YARWAY Bar-Stock Involute Nozzles



YARWAY Type B Involute Nozzles



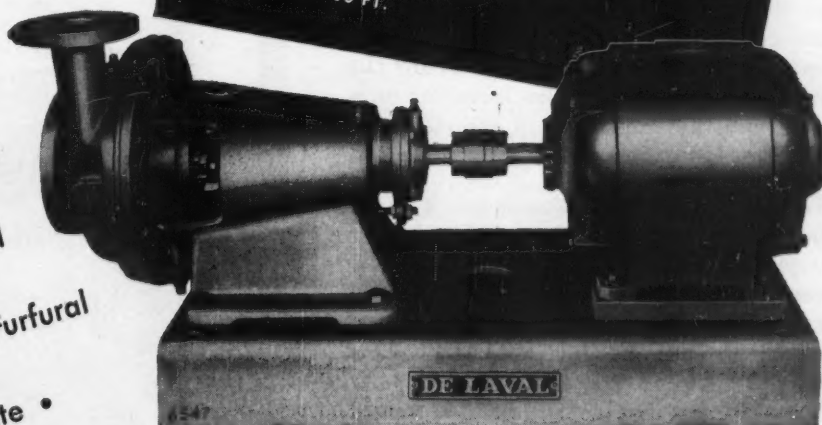
YARWAY Fan-Spray Nozzles

YARWAY

spray nozzles

• Calcium chloride brine • Flushing liquor
 Sodium sulphate • Asbestos fiber & cement mix • Green liquor •
 Soap solution • Grinder coolant • Carbon slurry • Cane wash • Salt brine • Sea water •
 • Caustic solution • Bleach liquor • Grape juice concentrate • Tomato juice concentrate •
 Tomato puree • Propanol • Soap liquor • Cane juice • Aqueous lime • Coke oven oil •
 • Paper stock • Waste sulphite liquor • Alkylaryl sulfonate • Sugar liquor • Vinyl pyridine
 • Saturated brine • Grape juice • Tomato juice • Press liquor • Calcium bisulphite • Melt
 Phenolized ammonia • Ammonia liquor • Sulphuric acid • Paraffine oil and water • Sludge
 • Milk waste • Gritty water • Cane syrup • Lime & soda solution • Cachaza • Clear juice
 White water • Mineral oil • Chromic acid
 Brine • Vegetable oil • Licorice liquor •
 • River water • Benzine thinner • Mash
 Methylene chloride • Sodium hydroxide
 Sizing solution • Alcohol •
 • Steep soda • Caustic soda
 Black liquor • Ethylene glycol
 • Fuel oil • Furfural
 • Condensate •
 Cement • Gasoline • Depanol
 Flume water •

*One pump handles
 all these liquids...*
DE LAVAL
CPO PROCESS PUMP
 CAPACITIES TO 2,000 GPM
 HEADS TO 200 FT.



DE LAVAL Centrifugal Pumps

DE LAVAL STEAM TURBINE COMPANY

803 Nottingham Way, Trenton 2, New Jersey

DL 289

WRITE FOR BULLETIN 1125-B

CHEMICAL ENGINEERING—February 1955

153

From one source . . . any instrumentation you need

When it comes to measurement and control, every industrial process is different. Each demands its own combination of accuracy, economy, instrument ranges, and all the numerous other characteristics that are peculiar to the individual application.

No single instrument and its accessories could possibly fit every process. So Honeywell makes a broad variety of measuring and controlling equipment that spreads across a tremendous range of applications.

The advantages are two-fold. First, you can get all the instrumentation your process requires from a single source, so there is undivided responsibility for the complete installation. And second, you are assured that the equipment selected for your process is recommended without bias . . . neither over-sells nor under-equips . . . needs no stretching, squeezing or compromising to fit it to its assignment.

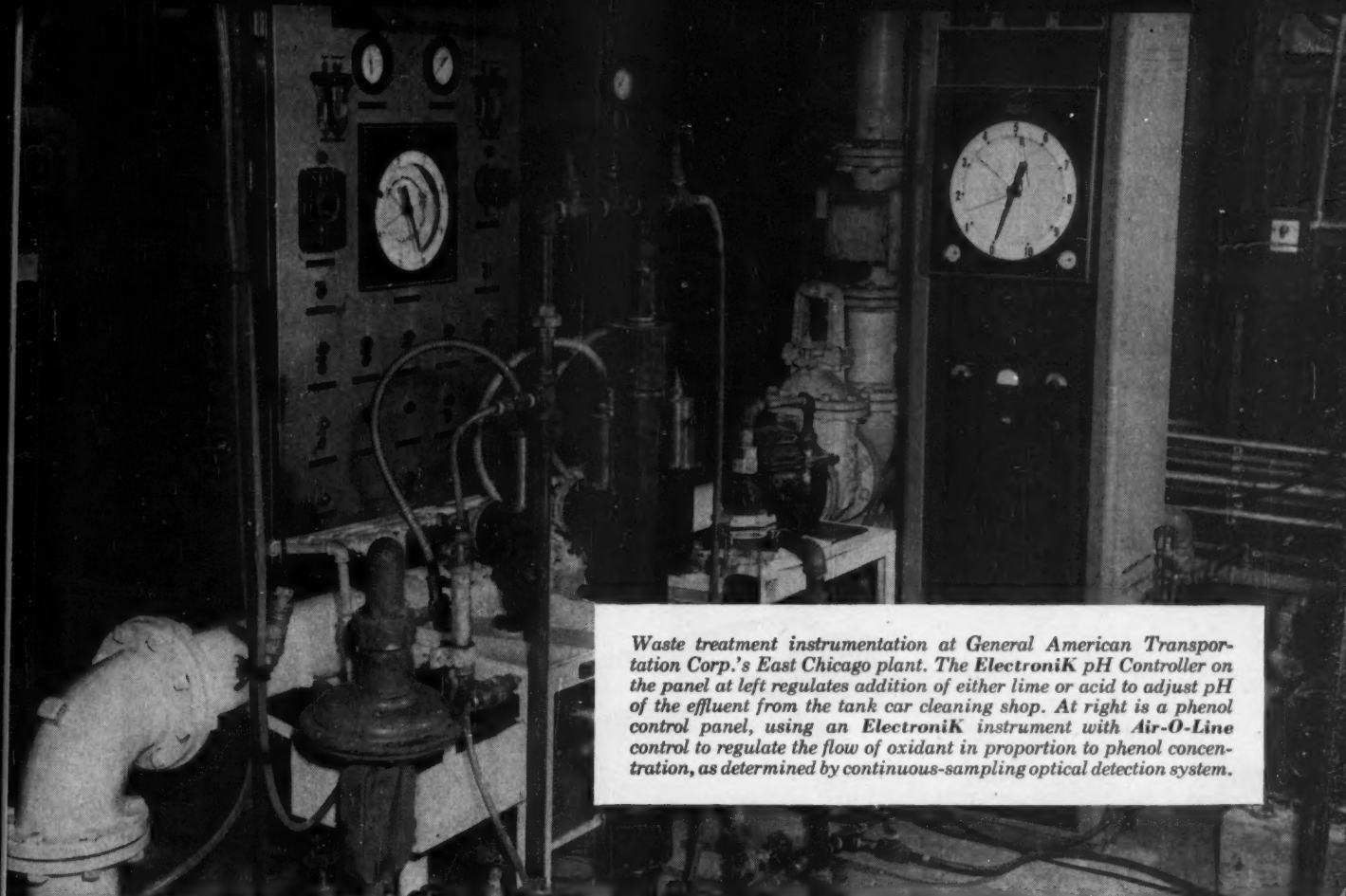
This versatile family includes *ElectroniK* indicators, recorders and controllers in circular and strip chart models, applicable to temperature, pressure, pH, power and dozens of other variables; square root flow meters for control applications; evenly graduated flow meters for cost accounting; thermometers, pressure gauges and liquid level meters; *Pyr-O-Vane* millivoltmeter controllers. Especially useful for graphic panels are the *Tel-O-Set* miniature indicators, recorders and controllers. Electric and pneumatic control systems range from the simplest to the most complex, including automatic program controls and complete systems developed for particular processes.

Working with these instruments is a full choice of primary elements . . . thermocouples, *Radiamatic* radiation elements, pressure-type and electrical resistance thermal systems, flow meter bodies, pH cells and many others. For final control elements, you can choose from a wide range of electric motorized and diaphragm operated valves. To complete the picture, there are more than 7000 non-indicating devices for controlling temperature, pressure, vacuum, liquid level and humidity . . . an unmatched variety of instrumentation made by the world's largest manufacturer of control equipment.

New methods of waste treatment aided by . . .



Phenol concentration in final effluent at a large refinery is checked by infra-red spectrometer, which utilizes an *ElectroniK* instrument to record data.



Waste treatment instrumentation at General American Transportation Corp.'s East Chicago plant. The *ElectroniK* pH Controller on the panel at left regulates addition of either lime or acid to adjust pH of the effluent from the tank car cleaning shop. At right is a phenol control panel, using an *ElectroniK* instrument with *Air-O-Line* control to regulate the flow of oxidant in proportion to phenol concentration, as determined by continuous-sampling optical detection system.

ElectroniK instrumentation

MANUALLY regulated, batch-type treatment of industrial wastes is rapidly being superseded by fully automatic, continuous processes that utilize *ElectroniK* instrumentation to the fullest extent. The advancing technology of waste treatment recognizes that this problem is one of chemical engineering—and consequently can benefit by the same processing and control techniques that have sparked progress in production operations.

Instrumentation used by General American Transportation Corporation is an excellent example of modern methods. Used for the treatment of phenol and oil bearing wastes from tank car cleaning, it affords pin-point accuracy capable of detecting phenol concentrations as small as 0.001 part per million. Under control of *ElectroniK* instruments,

the process functions continuously with minimum operating costs, reduced storage capacity and peak throughput. The instruments analyze chemical concentration, make a permanent record of effluent characteristics, and automatically regulate the addition of reagents.

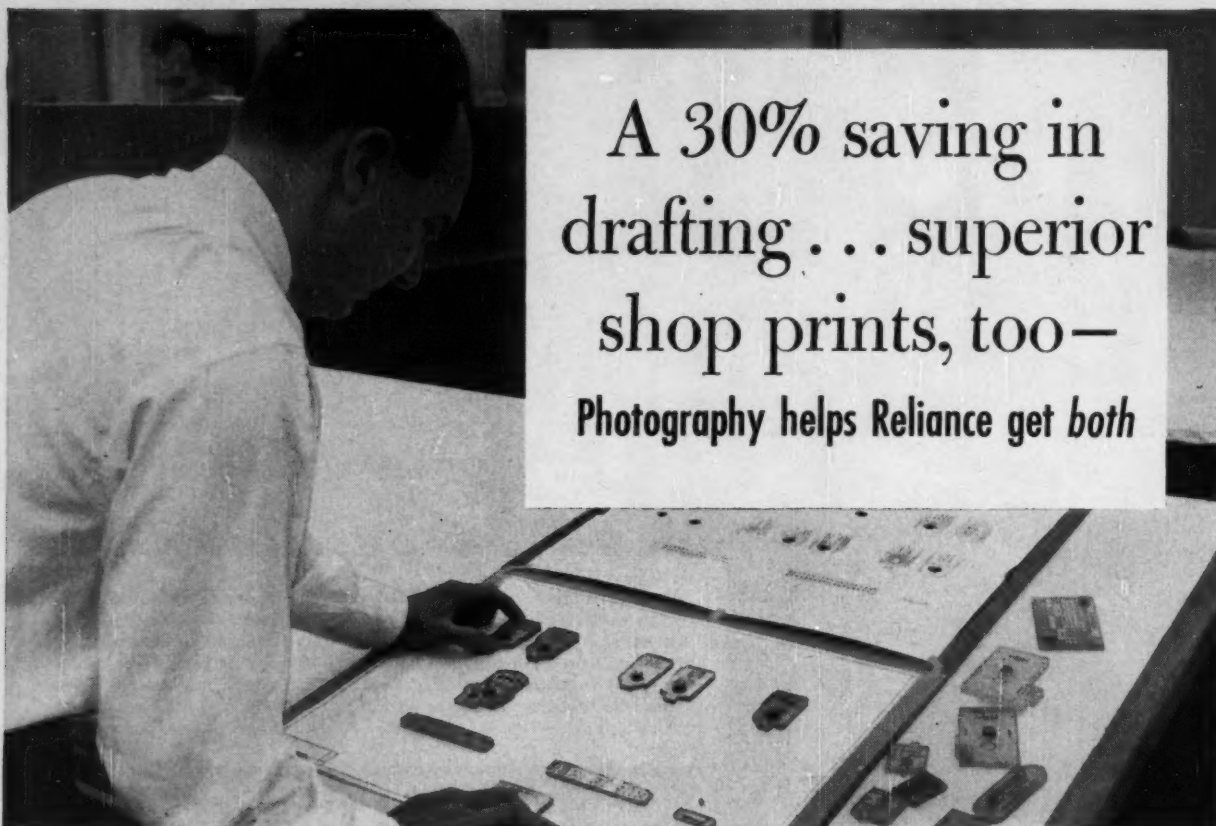
Versatile *ElectroniK* instrumentation can help reduce your plant's share of the cost of preventing stream pollution . . . by eliminating the expense of laboratory analysis, reducing treatment plant labor requirements and cutting chemical consumption. Your nearby Honeywell sales engineer will be glad to discuss your waste problem . . . and he's as near as your phone. MINNEAPOLIS-HONEYWELL REGULATOR CO., Industrial Division, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● REFERENCE DATA: Write for Bulletin 7302, "Instrumentation for Water, Sewage and Industrial Waste Treatment".



MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls



A 30% saving in
drafting . . . superior
shop prints, too—
Photography helps Reliance get both

At the Reliance Electric & Engineering Co., Cleveland, Ohio, the use of photographic templates and Kodagraph Autopositive Paper has helped to lower drafting-room costs by at least 30%, besides assuring highly legible shop prints day in and day out.

The templates—on clear plastic—represent the designs of standard components that appear again and again in Reliance's many wiring diagrams. A draftsman uses them, first, to make a preliminary drawing—positioning the templates he needs on whiteprint paper, making a print, then roughing in the hook-up lines.

After this drawing has been approved, he prints the templates on Kodagraph Autopositive Paper, using a printing frame. Simple photographic proc-

essing—under normal roomlight—produces a positive print of the layout directly. All he has to do now is add the hook-up lines, and another drawing is ready for Reliance's file of photo-lasting Autopositive "originals." *Another saving can be chalked up!*

Reliance has found these photo-drawings to be ideal printing intermediates. They're evenly translucent, durable; have crisp, dense black lines. And they produce top-quality shop prints at practical, uniform speeds in Reliance's direct-process machine.

Learn how thousands of companies are simplifying drafting and drawing reproduction routines, and protecting valuable originals with Kodagraph Autopositive Paper. See how you, or your local blueprinter, can process this sensational material quickly, at low cost. Mail coupon today.

Kodagraph Autopositive Paper

"THE BIG NEW PLUS" in engineering drawing reproduction

MAIL COUPON FOR FREE BOOKLET

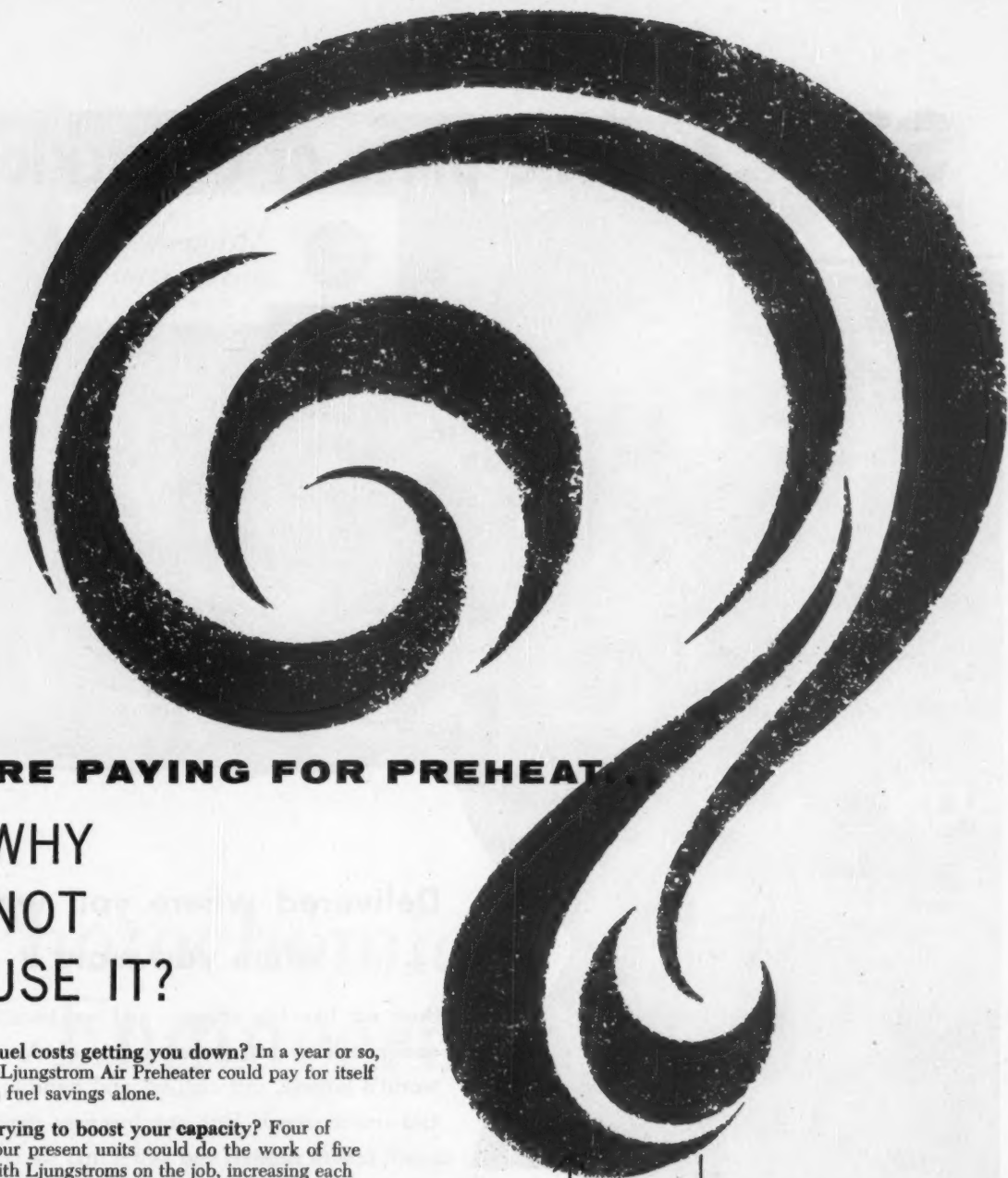
EASTMAN KODAK COMPANY, Industrial Photographic Division, Rochester 4, N. Y.

Gentlemen: Please send me a copy of "Modern Drawing and Document Reproduction," which gives all the facts on Kodagraph Autopositive Paper.

Name _____ Position _____
Company _____ Street _____
City _____ Zone _____ State _____

105

Kodak



YOU'RE PAYING FOR PREHEAT

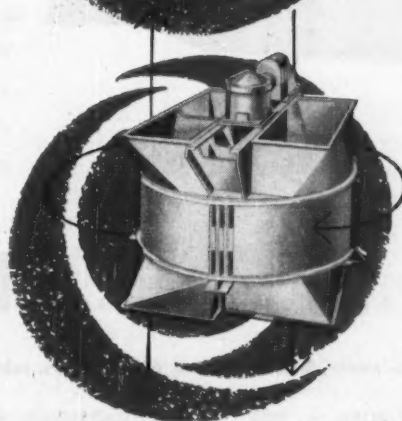
**WHY
NOT
USE IT?**

Fuel costs getting you down? In a year or so, a Ljungstrom Air Preheater could pay for itself in fuel savings alone.

Trying to boost your capacity? Four of your present units could do the work of five with Ljungstroms on the job, increasing each unit's output as much as 25%.

Turnaround taking too big a slice out of on-stream time? A Ljungstrom Air Preheater makes fuel burn more completely — at a higher temperature — greatly reducing the rate of slag build-up on furnace tubes. You'll stay on-stream longer — year in and year out — with a Ljungstrom.

Our Engineering Staff will be happy to show you how others have saved up to 20% on their annual fuel bills . . . increased throughput as much as 25% . . . reduced slagging and actually improved product octane ratings with Ljungstrom Air Preheaters. Write today for full details.



WHEREVER YOU BURN FUEL, YOU NEED LJUNGSTROM

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

STEEL...one piece or a truckload



**Delivered where you want it
... when you want it**

Sure we like big orders—and we handle them easily, every day, because our stocks are the world's largest, our cutting and handling facilities unsurpassed. But our business depends on small orders as well, and you'll find we never lose sight of this fact. Whether you want one bar or a thousand—one sheet or many tons, you'll get courteous service—quick delivery. Dependable, certified quality, too. Call us and see.

JOSEPH T. RYERSON & SON, INC.

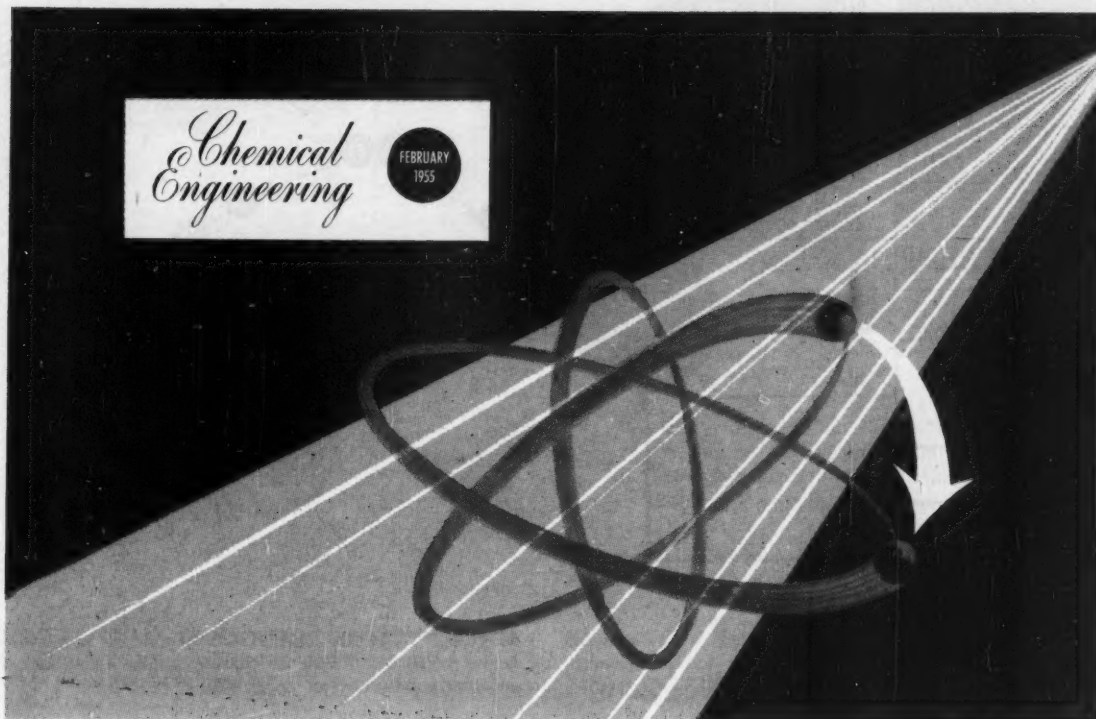
RYERSON STEEL

Principal products in stock: Bars, structurals, plates, sheets, tubing, alloy steel, stainless, re-bars, etc., also machinery & tools

PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT • BUFFALO
PITTSBURGH • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

*Chemical
Engineering*

FEBRUARY
1955



Photochemical Engineering

by

C. M. DOEDE and C. A. WALKER

1. Where used
2. Electromagnetic waves
3. Ultraviolet sources
4. Reactions, processes
5. Process costs
6. Reactor layout

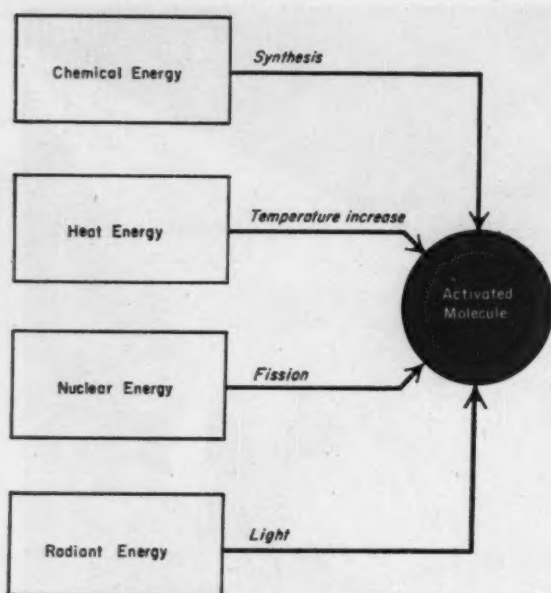
THIS report is a pioneering effort for *Chemical Engineering*. While photochemistry has been with us for well over 30 years—and has progressed to somewhere between an art and a science—there has never been a thorough published discussion of the engineering aspects of the subject.

We feel that our authors are extremely well-qualified to fill this gap in the literature. In addition, supporting information has come from many sources and places. By the time you read this we will have spoken to over 100 individuals about the subject matter in this report. We'll have asked more than 30 companies to add information to it. Field editors in San Francisco, Houston, Chicago, Washington, and Frankfurt, Germany, have contributed.

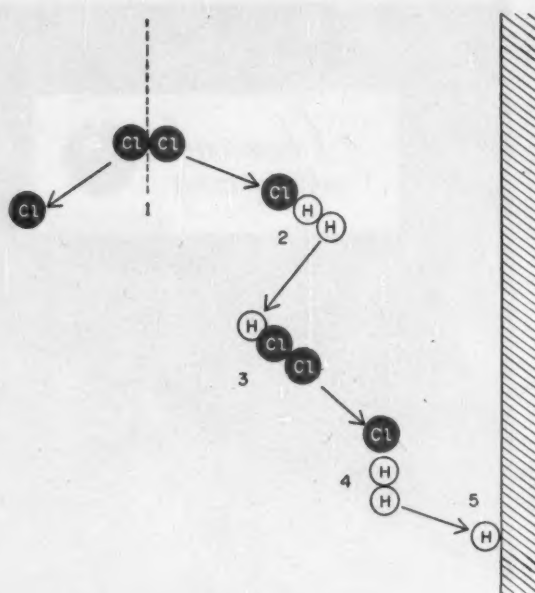
The techniques and know-how of the photochemical engineer are obscured by trade secrecy. A typical example: we learned of a successful pharmaceutical process that had been taken through the pilot plant into full-scale equipment. In reply to our request for more information, the company had to refuse; further, asked us not to mention their name anywhere near this report lest it aid their competitors. We reluctantly complied.

Major advances in engineering science are stimulated by the exchange of basic information among engineers. The potential usefulness of photochemical activation (including use of gamma rays) demands wider understanding of its basic principles.

—R. F. FREMED



CHEMICAL REACTIONS can proceed when activated molecules are present in a system. The activation energy can be chemical, thermal, nuclear or radiant.



STRAIGHT-CHAIN REACTION of chlorine and hydrogen begins when a molecule of chlorine splits. Continues until an atom is adsorbed on vessel wall.

1. Where Photochemical Engineering

THE possibilities of applying photochemical methods to the manufacture of various chemicals have excited the imagination of chemical engineers ever since the first researches on this method of increasing reaction rates and causing selected reactions to occur were reported.

There is a vast literature on this subject. Most of it concerns either the part that photochemistry plays in the growth of plants, or the use of photochemistry to explain mechanisms of chemical reactions and the structure of matter. Relatively little has been done in the field of engineering aspects of photochemistry, such as the design of reactor systems.

The primary purpose of this report is to review the present status of industrial photochemistry and state some of the problems that will need some chemical engineering attention as further development occurs.

What Is Photochemical Activation?

The process which consists of activating chemical bonds by absorption of electromagnetic radiation, and an ensuing chemical reaction, is referred to as photochemistry. The unique characteristic of the photo-

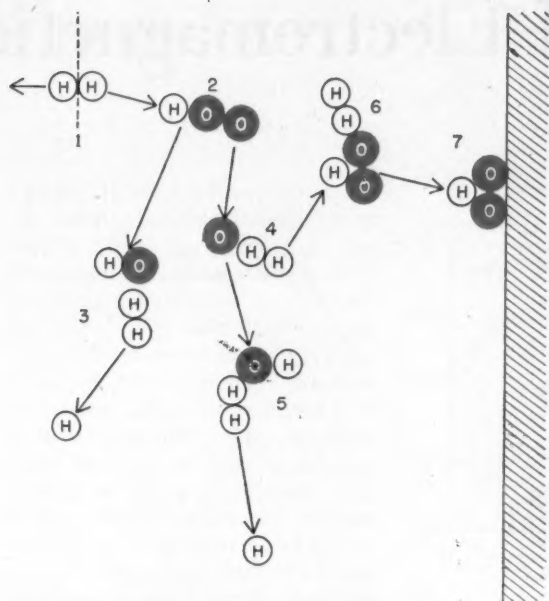
chemical activation of chemical bonds is simply that the process of light absorption is highly specific.

Thus, if light of an appropriate wavelength is applied to a given molecule it is frequently the case that the energy level of only one bond in the molecule is increased appreciably. Such behavior is in direct contrast to the increases in rotational, translational and vibrational energy levels that usually result from thermal activation of molecules. The nature of photochemical activation is such that it should be possible, for example, to activate a single bond in a thermally unstable molecule without danger of decomposition.

Commercial Applications

Commercial applications of photochemical activation in its broadest sense are so varied in nature—embracing such diversified fields as sterilization, printing, vitamin enrichment, photography, polymerization, odor control and halogenation—that we must limit this discussion.

We will consider only the synthesis of relatively simple molecules. Even within these bounds, however, it is possible to speculate to some extent on the future of photochemical engineering.



BRANCHED-CHAIN REACTION of hydrogen and oxygen frees three hydrogen atoms. Reaction stops when most hydrogen atoms form the unreactive HO_2 radical.

Can Be Used

There are two distinct characteristics of photochemical activation that are of particular interest in industry. First, photochemical activation can be used in certain instances to increase the rate at which a reaction occurs without changing the nature of the products. The chlorination of methane is an example of this. Here ultraviolet light permits you to carry out the reaction at high rates and at lower temperatures. This minimizes a possible explosive side-reaction to carbon.³⁴

Secondly, photochemical activation can be used to take advantage of its specific effect on the course of a reaction. Chlorination of the side chain of toluene can be carried out photochemically almost to the exclusion of chlorination in the nucleus.³⁴ Hydrogen sulfide can be activated photochemically to add to endolefins and yield the primary mercaptans.^{36, 39, 40}

Side reactions involved in the thermal reaction

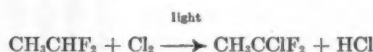


are avoided by this reaction scheme:³⁸



CLINTON M. DOEDE, left, born in Illinois 44 years ago, vice president and general manager of the Connecticut Hard Rubber Co., and president of Quantum, Inc., Mt. Carmel, Conn., took his doctorate at the University of Chicago in 1934. He is a director of the Rubber Division of ACS and chairman of the Committee on Elastomers of the National Security Industrial Assn. Much unpublished work on radiation damage and photochemical activation in the liquid phase has been done under his supervision. Dr. Doede and his wife Dorothy (Ph.D. in bacteriology) have found time to visit all the continents, a majority of the countries of the world, fly over 100,000 miles outside the continental United States and to raise four children.

CHARLES A. WALKER, right, associate professor of chemical engineering at Yale University is a tall Connecticut Texan, 40, married and the father of three boys. He obtained his BS (1938) and MS (1940) at the University of Texas and his D. Eng. at Yale in 1948 by combining study with consulting and teaching. As a consultant, Prof. Walker has been active since 1942 in the fields of corrosion, organic reactions, rubber, industrial waste disposal and photochemical activation. He is the author of many technical articles.



followed by



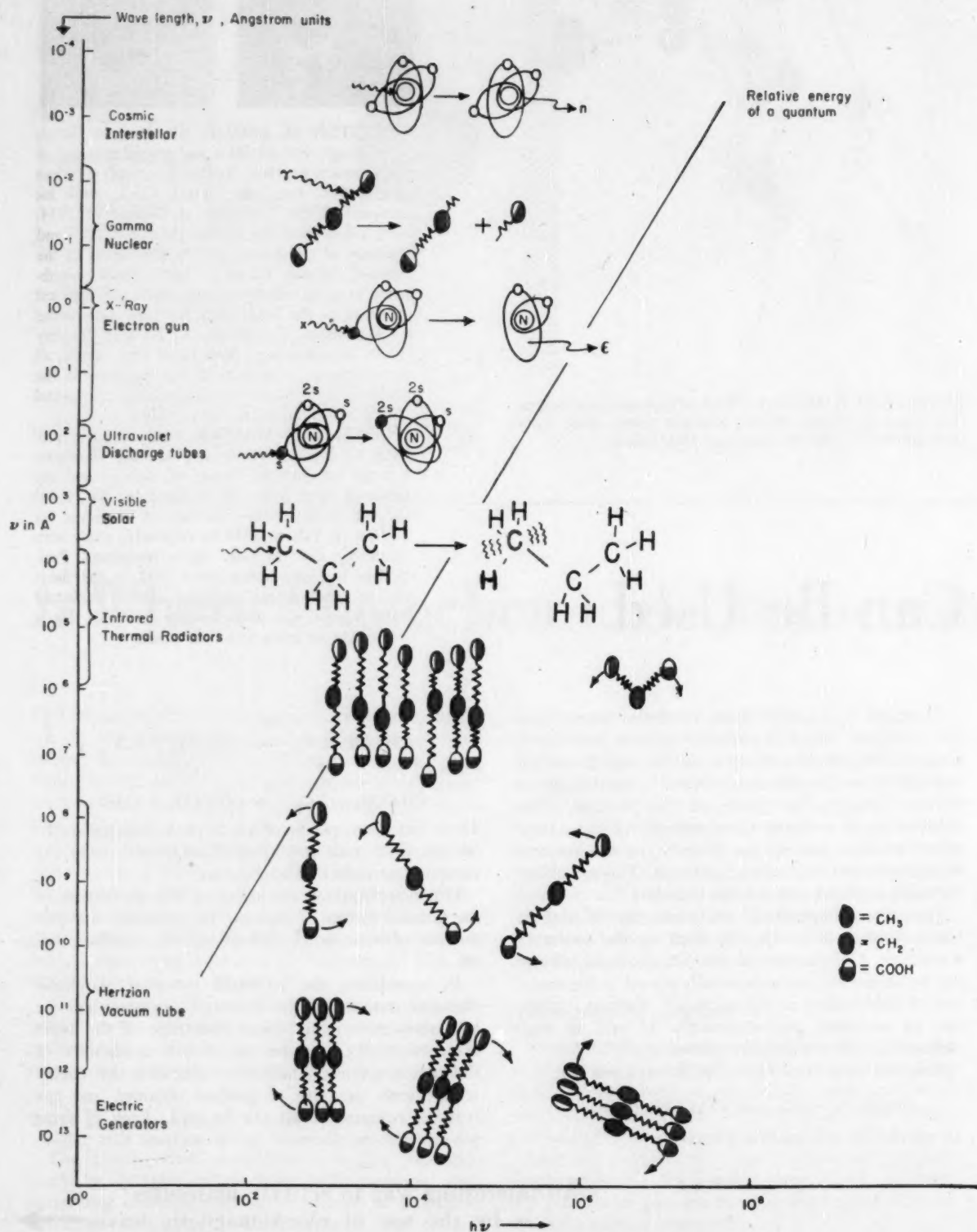
These and other specific effects of photochemical methods are their most important characteristics from the viewpoint of industrial application.

Other applications are found in the production of the gamma isomer of benzene hexachloride, the production of vitamin D, polymerizations, sterilizations, etc.

In considering the industrial potential of photochemical activation, the chemical engineer will be interested primarily in some knowledge of the types of reactions that can be carried out, availability of the sources of electromagnetic radiations, the energy requirements per unit of product obtained and the types of equipment that can be used. Each of these subjects will be discussed in the sections that follow.

An interesting way to activate molecules
is by the use of electromagnetic waves →

2. The Spectrum of Electromagnetic



Waves

THE electromagnetic spectrum embraces radiations with wavelengths extending from a few hundredths of an Angstrom unit (1 Angstrom = 0.0000001 mm.) to several miles, all of which travel in vacuum with the speed of ordinary light. Many properties of such radiations (refraction, dispersion, reflection, interference, diffraction, etc.) are most easily discussed in terms of the electromagnetic theory of Maxwell. This assumes that displacements forming wave trains of radiation are of the nature of alternating electric currents with their various associated magnetic effects.

However, to explain such effects as the liberation of electrons from metals by absorption of light or X-rays, the dissociation of molecules into atoms or radicals by the absorption of light, etc., it is convenient for us to think of these radiations as being emitted or absorbed in discrete amounts of energy called quanta.

Quantum theory provides a relationship between the energy of a quantum and that characteristic of the radiation which is called frequency.

$$e = h\nu$$

where,

e = Energy of a quantum, ergs

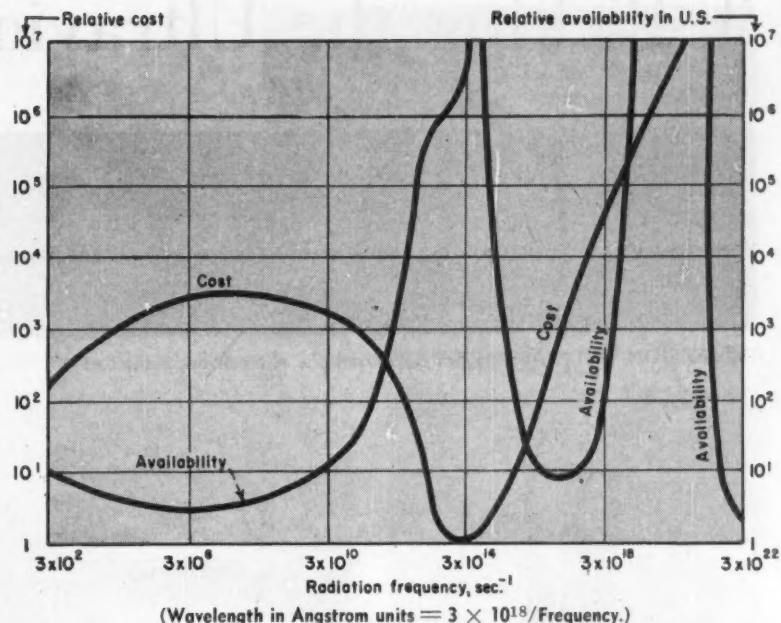
h = Planck's constant, 6.6237×10^{-27} erg-sec.

ν = Frequency, sec.⁻¹

The frequency is a defined quantity related to the wavelength of the radiation. The wavelength is determined experimentally—usually by comparison with spectra of accurately known wavelengths.

The enormous range of wavelengths involved in the electromagnetic spectrum is indicated in the figure on the facing page. The portions of the spectrum which are of interest in photochemical activation are most easily pointed out by noting the natures of the changes that give rise to radiations.

Gamma rays are due to changes in the energy levels of the nuclei of atoms, X-rays to changes in the inner



RELATIVE AVAILABILITY and COSTS of electromagnetic radiations show that, for the present, the future of photochemical activation lies unquestionably in the ultraviolet area. Availability of large quantities of gamma radiation in the future might alter this.

electron shells of atoms, ultraviolet and visible light to changes in the outer shells, and infrared rays to changes in the vibrations of atoms bound together as molecules or to changes in the rotation of molecules. Note that these are reversible processes.

Since chemical changes involve the outer electron shells of atoms, ultraviolet and visible light should be most effective in initiating chemical reactions by the primary formation of atoms or radicals. X-rays and gamma rays should also result in chemical reactions when they are absorbed—reaction occurring after primary formation of ions. We can see that the portion of the spectrum which is of greatest interest in photochemical activation ranges from visible light to gamma rays.

Just which portions are of greatest interest must be decided on the basis of:

- The importance of advantages gained by the use of radiation, such as activation of a specific bond.
- Availability
- Cost

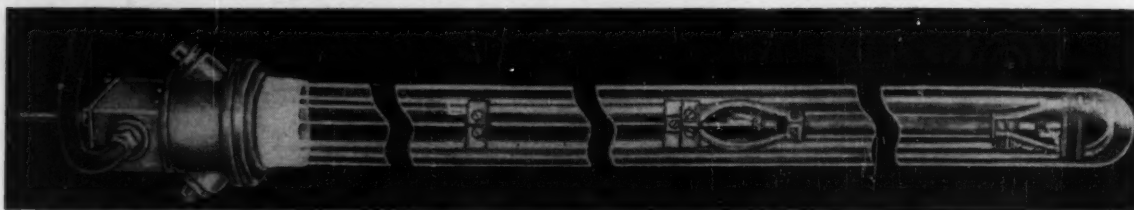
With regard to availability and cost, we have tried to indicate what can be expected in the future of the various wavelength regions, refer to figure above. You can see that the cost and availability of radiation in the visible and parts of the infrared and ultraviolet regions are of a completely different order of magnitude from those in other regions. This is unquestionably the area in which the future of photochemistry lies. Availability of large quantities of gamma rays might alter this in the future. A considerable amount of investigation into the feasibility of using gamma radiation for initiating chemical changes is now going on.

Although the price of gamma radiation will remain high—even if the sources originate in radioactive wastes—it is possible that the desired effects which can be gained will offset this cost.

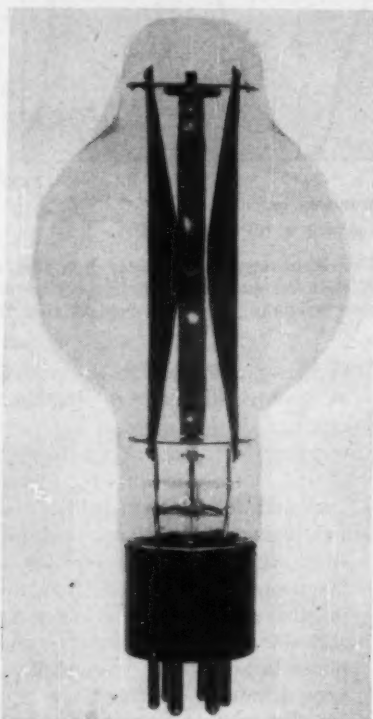
In approaching the problem of developing sources of ultraviolet radiation for industrial photochemistry you might inquire first about the feasibility of using the ultraviolet portion of sunlight. This possibility appears at

The future of photochemistry appears to be in the ultraviolet area →

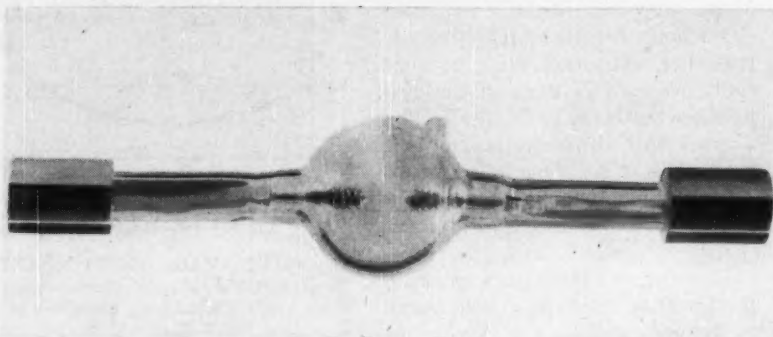
3. Picking the Ultraviolet Source



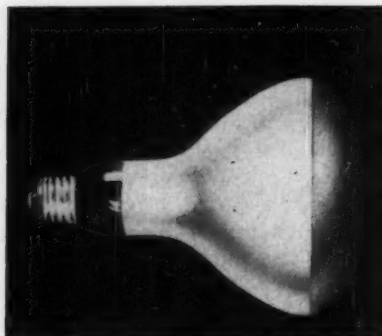
IMMERSION-WELL ASSEMBLY (Hanovia) for photochemical reactors.



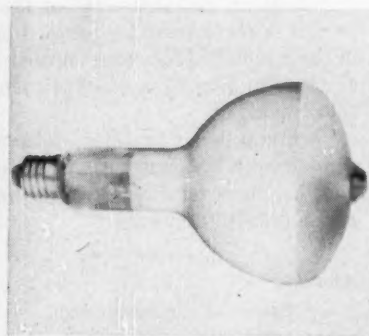
ZIRCONIUM ARC (Sylvania).



XENON COMPACT ARC (Hanovia) gives continuous ultraviolet spectrum.



RS SUNLAMP (GE), 275 watts.

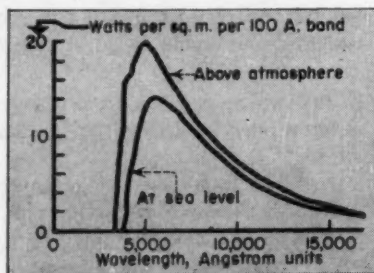


K-H1 or L-H1 (Westinghouse), 400 w.

There are many different types . . .

first glance to be very attractive. We frequently hear about the ultraviolet rays in sunlight and about the use of sunlight by plant life.

However, there are two important facts to remember. The portion of sunlight which lies in the ultraviolet range is actually quite small (see cut) despite its importance. About half of the energy of sunlight is in the visible range and half in the infrared. Plants are able to use sunlight because green chlorophyll absorbs most of the visible portion of sunlight (4,000 to 6,500 Angstrom units) and to use the energy



SUNLIGHT spectral distribution.

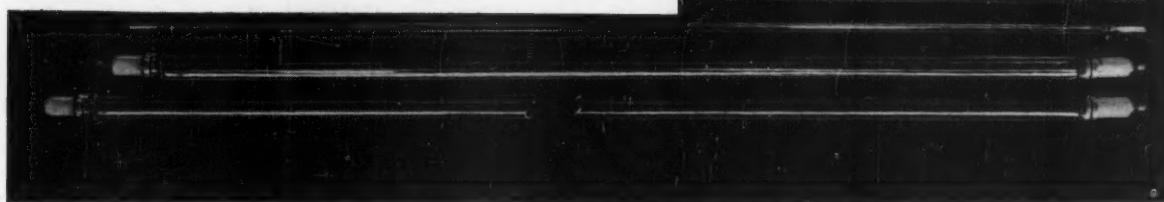
obtained this way in photosynthesis.

The visible light which is rendered effective in photosynthesis is in a

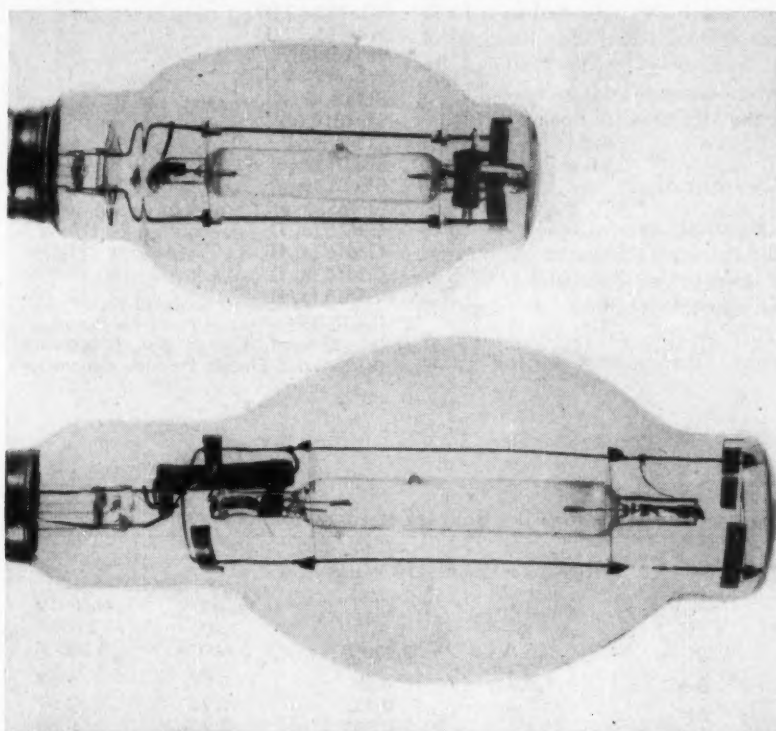
region where energy levels correspond to less than that involved in most chemical bonds. The development of a further understanding of the functions of chlorophyll and the possibility of duplicating these functions with other materials offer one of the most fascinating challenges in science today.²¹ The relationship of such studies to the problem of fuel sources for the future is evident.

Since relatively few reactions of industrial interest other than chlorination are activated by visible light, extensive use of sunlight in industrial

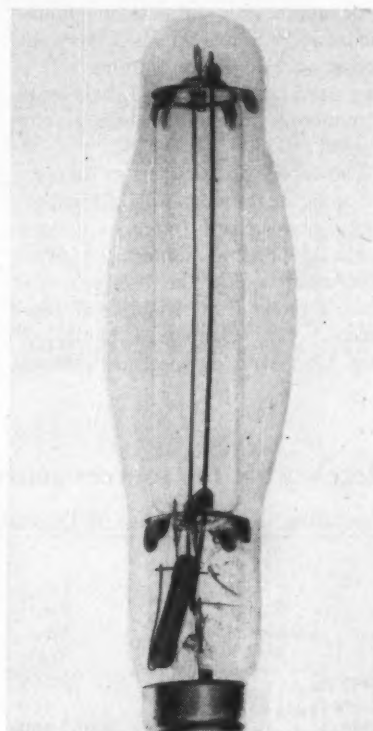
and Sheath



UA-2, 250 watts; UA-3, 360 watts; UA-11, 1,200 watts; UA-4, 1,200 watts; UA-14, 1,400 watts; UA-7, 3,750 watts.



C-H5 (top), 250 watts and E-H1 (bottom), 400 watts, have quartz arc tubes.



A-H1 (all mfrs.) 400 watts.

photochemistry appears to depend on the further development of methods for rendering the visible wavelengths effective.

Furthermore, since the total energy of sunlight falling on the United States averages about 1 kcal./sq. ft.-min. (0.078 kw./sq. ft.-min.), it would probably be necessary to concentrate this in order to use it effectively. Methods of concentrating the energy of sunlight are rather well de-

veloped as a result of studies involving the utilization of sunlight as a heat source.

At the present time the radiation sources of greatest interest in industrial photochemistry are the various mercury lamps. The low-pressure mercury-rare gas discharge lamps that have been developed for germicidal use have relatively low outputs. But the radiation is in a very useful range.

Most of it is of wavelength 2,537

Angstrom units. The 1,849 Angstrom line is also present and may, under certain conditions, be of an intensity as high as that of the 2,537 Angstrom line.

Until relatively recently these lamps have been available only in sizes of 4 to 40 rated watts with outputs at 2,537 Angstrom units up to about 15 watts.^{14, 20}

More recently there has appeared a considerably more powerful germicidal

... and they have different characteristics and costs →

3. Picking the Ultraviolet Source and Sheath (continued)

lamp of 1,500 rated watts with a germicidal radiation output (2,100 to 3,200 Angstrom units) equivalent to 125 watts at 2,537 Angstrom units.²⁰ In the fluorescent lamp this light is converted to visible light by phosphors contained in the glass sheath.

Only the black-light tube with a peak output at 3,500 Angstrom units is of appreciable interest in photochemistry.²¹ Since this is a very effective wavelength for chlorine activation, applications of this tube should be numerous in commercial-size reactor designs.

The tables on these pages summarize some of the operating characteristics of low-pressure, medium-pressure and high-pressure sources of ultraviolet energy. There are four principal manufacturers of these lamps: General Electric Co., Hanovia Chemical & Mfg. Co., Sylvania Electric Products,

Inc. and the Westinghouse Electric Corp.

Data for lamps listed by more than one manufacturer represent an industry average which may be slightly different from the specific data on each manufacturer's product. We are indebted to L. J. Buttolph for permission to adapt his tables for our use. They are to be published in a forthcoming book, "Radiation Biology-Vol. II" sponsored by the National Research Council and to be published by the McGraw-Hill Book Co., Inc.

Glass Sheaths

Relatively few materials are available that have the proper combination of strength and transparency to serve for the construction of ultraviolet source sheaths and photochemical reactors. Transparency of the proper

Designation	Rated Input, Watts
PREHEAT STARTING	
G4T4 (a, b, c).....	4
G8T5 (a, b, c, f).....	8
G15T8 (a, b, f).....	15
G30T8 (a, b, c).....	30
INSTANT STARTING	
WL-793 (f).....	3.5
OZ4514 (a).....	4
WL-794 (f).....	8
G4S11 (b).....	12
2851Q (e).....	14
WL-782-10 (f).....	14
WL-782-20 (f).....	17
2852Q (e).....	18
WL-782-30 (f, g).....	22
ST34A18 (e).....	32
ST34B18 (e).....	36
ST34I18 (e).....	16-17
ST46A22 (e).....	23-27
ST30A32 (e).....	30-34
ST 96S30 (e).....	36-39
G36T6 (a, f).....	
G36T6 (a, f).....	
G36T6 (a, f).....	
G36T6 (a, f).....	

(a) General Electric Co. designation;
(b) Sylvania Electric Products designation;

Here's what the sources generate . . .

Operating Characteristics of Typical Medium- and High-Pressure Sources of Ultraviolet Energy

Designation	Rated Input, Watts	Ultraviolet Output, UV Watts				
		Far UV, 2,200- 2,500 A.	Far UV, 2,500- 2,800 A.	Middle UV, 2,800- 3,200 A.	Near UV, 3,200- 3,600 A.	Near UV, 3,600- 3,800 A.
C-H3 (b, c).....	85	0.46	1.50	4.60	0.93	2.84
A-H4 (b, c, d).....	100	.....	.....	0.72	0.92	3.39
B-H4 (b, c, d).....	100	.....	.....	0.001	0.20	0.63
C-H4 (b, c, d).....	100	.....	.....	0.05	0.43	1.77
E-H4 (c).....	.....	.....	.....	.....	.....	.....
A-H5 (c, d).....	250	.....	.....	0.005	0.36	6.22
C-H5 (d, e).....	250	.....	.....	1.25	1.75	8.00
UA-2 (b, c).....	250	3.67	8.14	10.36	1.28	7.19
UA-3 (b, c).....	360	4.53	10.31	13.25	1.56	9.13
EH-1 (d).....	400	.....	.....	2.8	3	14.4
A-H15 (b, c).....	1,000	.....	.....	7.0	7.5	36.0
A-H6 (b, h).....	1,000	.....	.....	6.8	9.0	53.0
A-H12 (d).....	1,000	.....	.....	7.50	8.00	40.00
B-H6 (b).....	1,000	10.0	21.0	75.0	13.0	79.0
A-H14 (d).....	1,100	0.10	2.10	17.20	26.00	116.0
UA-4 (b, c).....	1,200	.....	.....	0.90	0.22	6.33
UA-11 (b, c).....	1,200	25.0	60.0	90.0	10.0	55.0
LL (c).....	1,200	.....	.....	.....	.....	72
SS (c).....	2,000	.....	.....	.....	.....	140
UA-15 (c).....	3,000	100.0	205	230	25	150
B-H9 (c, d).....	3,000	.....	.....	.....	0.24	21.32
C-H9 (d).....	3,000	0.30	6.80	53.40	6.10	80.50
BMS (c).....	3,500	.....	.....	.....	.....	278
UA-7 (b, c).....	3,750	.....	.....	3.89	3.77	71.62
PIS (c).....	4,800	.....	.....	.....	.....	330

(a) 5 hr. per start; (b) General Electric Co. designation; (c) Hanovia Chemical & Mfg.

Co. designation; (d) Westinghouse Electric Corp. designation; (e) Sylvania Electric Products designation; (f) Life, 1,000 hr.

with special operating conditions (g) Fixture should not exceed specified temperature limits; (h) A-H6 requires water jacket;

Low-Pressure Mercury-Vapor Sources of Ultraviolet Energy

Output, UV Watts After 100 Hr.	Density 1 Meter from Arc, Micro- Watts/Sq. Cm.	Maximum Length, In.	Useful Arc, In.	Maximum Diameter, In.	Open Circuit Voltage, Volts	Arc Potential Drop, Volts	Lamp Operating Current, Amps.	Continuous Rated Life, Hr.
0.69	8.1	5.75	6	0.5(e)	115	55	0.093	2,500(d)-7,500
1.5	17	12.125	8.5-9.0	0.625	115	58-61	0.165	2,500(d)-7,500
2.9-3.6	30-37	18	14	1.0	115	55	0.30	2,500(d)-7,500
7.2-8.4	72-86	36	32	1.0	210	100	0.34	2,500(d)-7,500
0.13	8.125	1.3	3	0.875	230	100	0.040	4,000
0.12	1.2	2.3	0.375	1.375	22	10	0.35	4,000
1.8	17	16.125	12	0.520	2,000	300	0.030	12,000
2.0	20	14.75	10	0.625	950	240	0.060	17,500
2.0	20	24.75	24	0.625	950	235	0.055	17,500
3.3	36	29.375	30	0.520	3,000	450	0.030	12,000
5.2	46	34.75	30	0.625	950	410	0.050	17,500
4.5	50	34.5	30	0.620	2,000	375	0.045	12,000
3.4	34	16.125	11	0.6875	600	200	0.120	12,000
7.0	77	30.125	25	0.6875	600	300	0.120	12,000
8.0	88	spiral	96	0.620	3,000	800	0.045	7,500
6.3-8.0	65-70	34	29.25	0.625-0.75	450-660	150-180	0.100-0.120	2,500(d, h)
8.7-12.2	90-105	34	29.25	0.625-0.75	450-660	135-150	0.10-0.22	2,500(d, h)
10.6-13.7	110-120	34	29.25	0.625-0.75	450-660	115-130	0.30-0.32	2,500(d, h)
11.6-14.8	120-130	34	29.25	0.625-0.75	440-450	105-120	0.42-0.43	2,500(d, h)

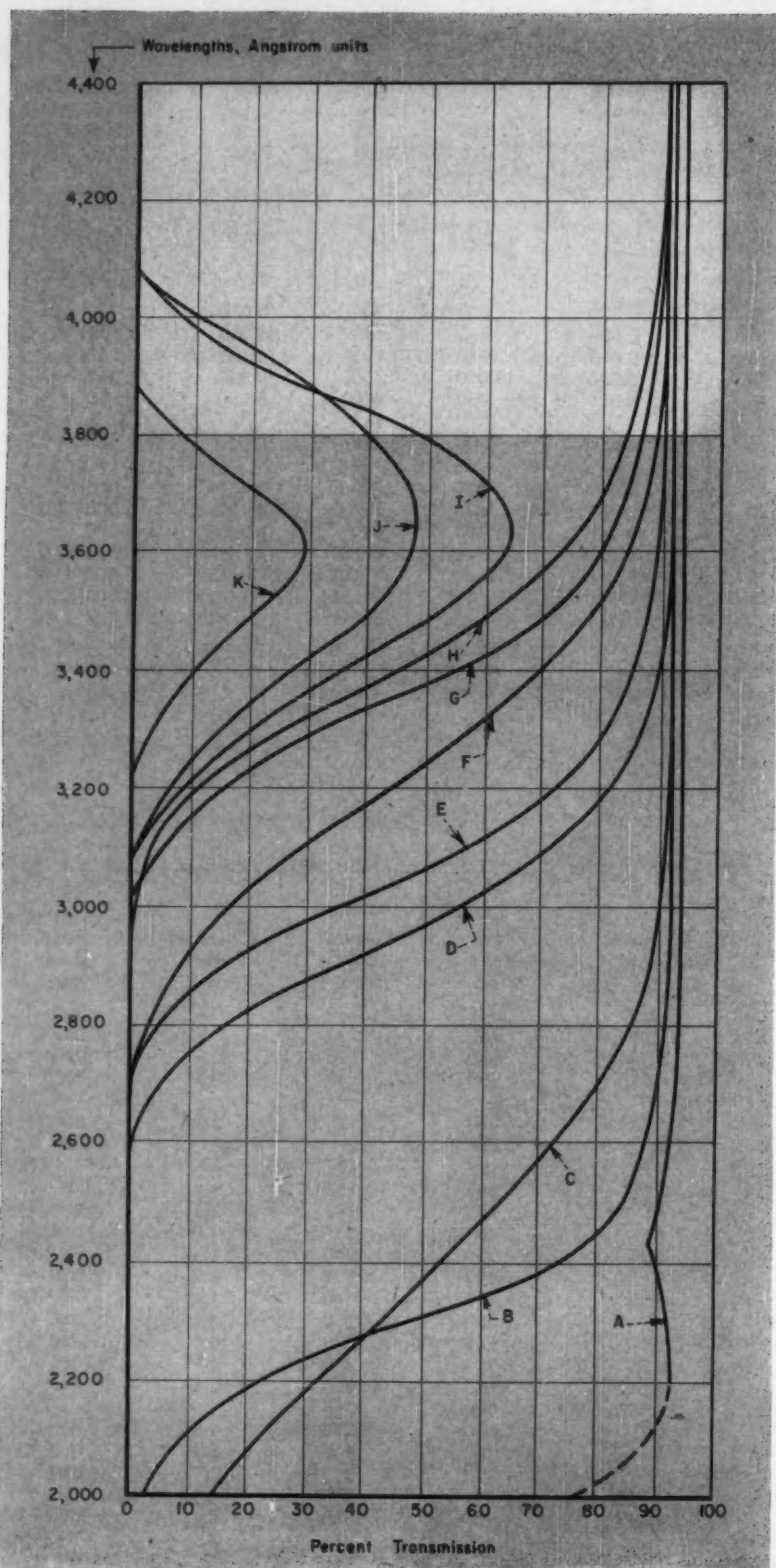
(c) Bent-tube construction makes lamp 1.125 in. wide; (d) At 3 hr. per start; (e) Hanovia Chemical & Mfg. Co. designation; (f) Westinghouse Electric Corp. designation; (g) for ozone production; (h) At 3 hr. per start. Life is 5,000 hr. at 6 hr./start and 7,500 hr. at 12 hr. burning per start.

Visible Energy Watts	Maximum Length, In.	Useful Arc, In.	Maximum Diameter, In.	Open Circuit Volts	Potential Drop Volts	Operating Current, Amp.	Average Rated, Life, Hr.
6.0	5.625	0.687	1.25	440	250	0.4	500
10.4	5.625	1	1.25	250	130	0.9	1,000
0.1	5.5	1	2.00	250	130	0.9	1,000
7.8	5.437	1	4.62	250	130	0.9	1,000
33.1	8	1.625	1.73	250	135	2.1	3,000(f)
30.0	8.312	2.125	3.5	250	135	2.1	6,000 (
18.8	6.625	3	0.75	225	92	3.1	(f)
24.9	10.25	6	0.75	260	135	3.1	(f)
55.0	11.5	2.75	4.625	220	135	3.2	4,000 (g)
143.0	15.125	5.875	7	460	265	4.0	4,000 (g)
290.0	3.25	1	0.25	1,250	840	1.4	(i)
158.0	15.375	5	7	220	135	8.2	6,000
290.0	3.25	1	0.25	1,250	840	1.4	(i)
116.0	21.22	14	1	500	250	4.2	2,000
40.5	56	49	1.19	245	125	10.5	1,000 (k)
126.0	22	17.75	0.75	750	450	3.1	1,000
.....	16.875	11.875	0.812	550	270	5.1	.....
.....	26.5	21.5	0.938	800	550	4	.....
310	52.5	48	0.50	2,650	2,000	1.58	1,000
357.4	56.8	50	1.19	850	535	6.1	3,000 (k)
358.0	56	49	1	850	535	6.1	2,000
.....	53.5	48	0.938	1,250	900	4.3	.....
361.0	71	64	1.19	1,100	660	6.1	1,000
.....	53.5	48	1	1,700	1,250	4.5	.....

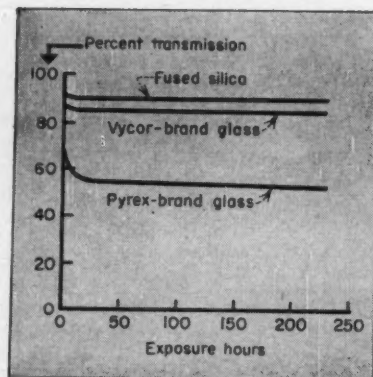
B-H6 requires air-jet cooling; (i) Life, 75 hr. starting; (k) Life, 10,000 hr. with special with special operating conditions; (j) Re- operating conditions; (l) only single bulb requires auxiliary device for starting and re- used.

... for what glass transmits →

... what glass will transmit



SPECTRAL TRANSMISSION of glasses and black-light filters. Glasses, 1 mm. thick; filters, 5 mm. Transmission decreases with thickness.



SOLARIZATION—the effect of exposure to ultraviolet on glass. Samples 6 in. from a 2,537 Å. mercury-vapor arc.

order is provided by optical glass, Pyrex-brand glass, Vycor-brand glass and fused silica (quartz) among commercially available materials.

The short wavelength limit for use of these materials is dependent on the wall thickness involved. This dependency is usually expressed by the extinction coefficient in the equation that follows:

$$I = I_0 \times 10^{-\alpha l}$$

where,

I = Intensity of light after passage through material

I_0 = Intensity of incident light on material

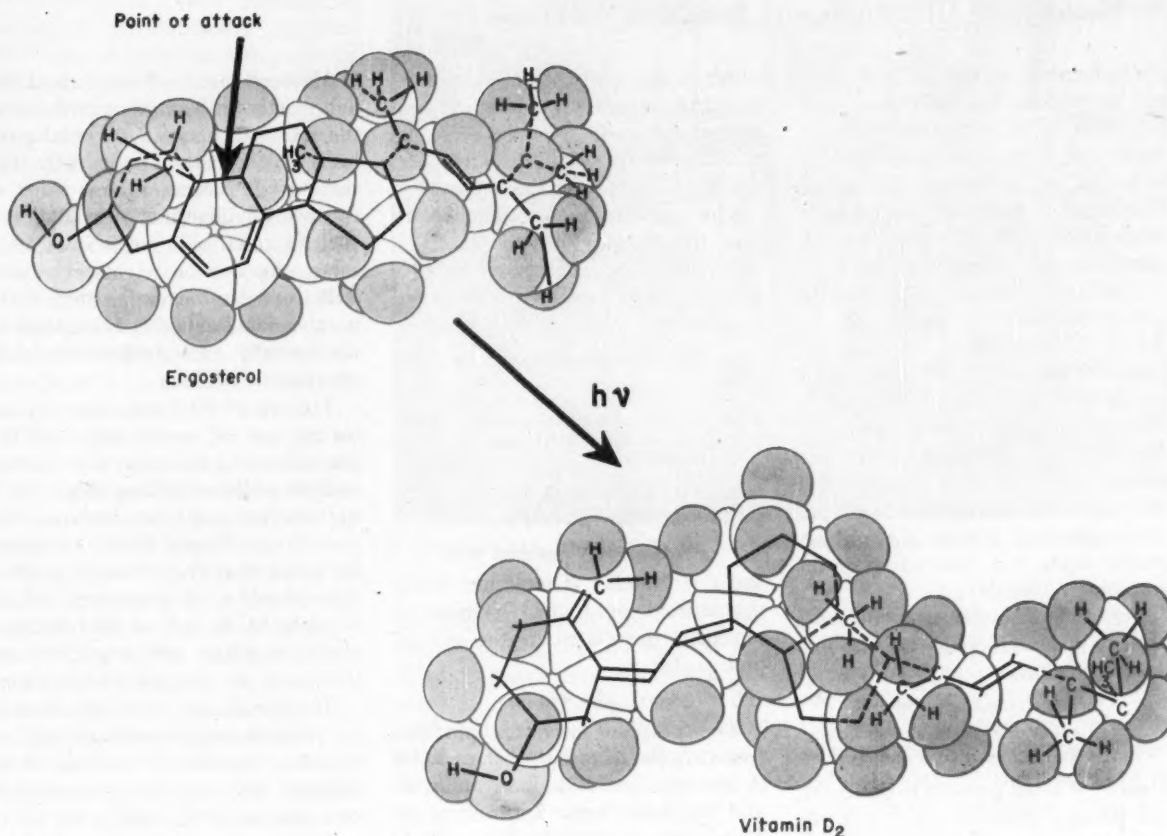
α = extinction coefficient

l = thickness, cm.

By way of example, Granath¹⁶ reports extinction coefficient for crystal quartz ranging from 0.05 at 2,100 Angstrom units to 0.18 at 1,850 Angstrom units. Fused silica is generally considered to be useful for transmission of wavelengths down to about 2,000 Angstroms. Though the use of greater thicknesses may limit the usefulness to wavelengths above 2,500 Angstroms, very thin windows may be useful down to the range of 1,500 Angstroms.

In thicknesses of 1 mm., optical glass is very useful for wavelengths as low as 3,500 Angstroms and borosilicate glasses for wavelengths down to 3,200 Angstroms.

One important design factor to be remembered is the effect of solarization. Glasses change physical properties after prolonged exposure to ultraviolet. (See cut above.)



4. Mechanisms, Reactions, Processes

In this section we'll discuss the kinds of reactions that can be carried out with photochemical activation and some of the factors involved in determining their commercial feasibility. This requires a preliminary discussion of the mechanism of photochemical reactions followed by:

- A few examples of reactions in which photochemical activation is useful. These are selected for the purpose of illustration and not for commercial feasibility.

- A discussion of some of the commercial processes on which information is available.

Mechanisms

The mechanism of photochemical reactions has been studied exten-

sively because of the bearing which such information has on the broader subjects of photosynthesis and reaction kinetics. Photochemistry is a particularly useful tool in the study of reaction kinetics because the nature of the activating step is understood to some extent. Also it offers a possibility of contributing much to our knowledge of the methods by which molecules transfer energy on collision.

We refer you to the excellent book by Noyes and Leighton²⁰ for an exhaustive discussion of the subject. Only the broadest considerations of mechanism need to be discussed here.

The photochemical process involves two distinct steps, the absorption of light by a reactant and the subsequent chemical reaction. According to the law of Grotthus and Draper—some

call it the first law of photochemistry—only light which is absorbed can be effective in producing chemical change.

Einstein's law of photochemical equivalence—sometimes called the second law of photochemistry—states that the absorption of light is a quantum process. It involves one quantum per absorbing molecule. The absorption of light may result only in vibrational or rotational energy changes, in which case the absorbing molecule is not rendered chemically active. In order for the absorbing molecule to be chemically active it is necessary that the absorption of light result in an electronic transition.

It is the selective nature of this electronic transition that distinguishes

4. Mechanisms, Reactions and Processes (continued)

photochemical activation from thermal activation. In the former case, activation of a particular bond can occur with only slight effects on other bonds in the molecule. Thermal activation of a particular bond can be achieved only by relatively large increases in the molecular energy.

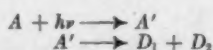
The primary process of photochemistry is considered to include the initial act of absorption and those immediately-following processes which are determined by the properties of the initially-excited electronic state (fluorescence, dissociation, deactivation by collisions, etc.). In almost all cases where the absorption of light produces chemical action, the primary process leads to a dissociation of the absorbing molecule.

For such cases we may define a primary quantum yield for the primary process as:

$$\phi = \text{Primary quantum yield}$$

$$\phi = \frac{\text{Number of molecules dissociated}}{\text{Number of quanta absorbed}}$$

Usually, it is not possible to determine the primary quantum yield; but you will note that ϕ can have a maximum possible value of 1.0. The primary process may be represented by the equations:



where A represents a molecule of reactant; A' represents an electronically excited state; and D_1 and D_2 are the products of dissociation. The products may be atoms or free radicals.

The secondary process is concerned with the chemical reaction itself. It may involve any of several possible reactions of D_1 and D_2 . If we represent the over-all quantum yield as:

Φ = Over-all quantum yield then,

$$\Phi = \frac{\text{Number of molecules finally decomposed or formed}}{\text{Number of quanta absorbed}}$$

Also, we can define a quantum yield for the secondary process as:

ρ = Secondary quantum yield and ρ = Number of molecules finally decomposed or formed/Number of molecules dissociated by the primary process. Or,

$$\rho = \Phi / \phi$$

The possible secondary processes following the dissociation of molecule A into the free radicals or atoms D_1 and D_2 have been summarized by Noyes and Leighton.²⁰ They use M to represent another molecule in the homogeneous phase or the surface of the reaction vessel. B and C represent stable molecules other than the absorbing species (see table below).

Although much is known about the nature of both the primary process and the secondary process, the total process is most important industrially. For the over-all process, a large value of the over-all quantum yield indicates a chain reaction; a small value indicates deactivation (collision with walls) or recombination; a small whole number value indicates dissociation of the initially excited electronic state into stable molecules.

The rate of the process may depend on any one of several steps and the photochemical activation is not necessarily the rate-controlling step. But if the reaction can't be activated, the over-all rate is zero. Finally, it should be noted that sometimes very small concentrations of impurities (which could be M, B, or C in the tabulation above) may have very large effects on the course of a photochemical process.

The possibility of using catalysts in photochemical processes has received a considerable amount of attention. The most common example of a catalyst in this field is the use of mercury atoms in a reaction mixture. Several patents on this have been issued.^{21, 22, 23, 24}

Reactions

The task of discussing the types of reactions which can be carried out by photochemical methods would be made much easier if either the reactions fell into distinct types—such as the chemical engineer's classification of unit processes—or if they could be classified in some more fundamental terms—such as the absorption spectra of the reactants.

Such a classification would be particularly attractive since the studies of absorption spectra are easier to carry out than are studies of photochemical reactions. We can't deny that in the hands of a skilled spectroscopist data on absorption spectra may be very useful in deciding whether irradiation causes a molecule to dissociate in such a way that a photochemical reaction might occur.

At any rate, this approach to the problem of classification is beyond the scope of this report, although it should

Possible Secondary Processes After Photochemical Activation

Reaction	Equation	ρ
Recombination	$D_1 + D_2 + M \longrightarrow A + M$	<1
Reactions with products or other molecules with regeneration of A	$D_1 + B \longrightarrow A + C$, etc.	<1
Non-chain reactions not involving or producing further molecules of A	$D_1 + D_1 \longrightarrow B + C$ $D_1 + D_1 \longrightarrow B$; $D_2 + D_2 \longrightarrow C$ $D_1 + B \longrightarrow C$, etc.	1
Non-chain reactions involving further molecules of A	$D_1 + A \longrightarrow B + C$	2 or 3
Chain reactions not involving further molecules of A	$D_1 + B \longrightarrow E + D_2$ $D_2 + C \longrightarrow E + D_1$	>1 (possibly >>1)
Chain reactions involving further molecules of A	$D_1 + A \longrightarrow B + D_2$ $D_2 + A \longrightarrow C + D_1$	>1 (possibly >>1)

be remembered when approaching studies of photochemical reactions. The less fundamental but more familiar unit-processes classification will be used here. The reactions discussed below are chosen purely to demonstrate the versatility of photochemical methods and do not necessarily represent commercially feasible processes.

► **Halogenation**—This undoubtedly represents the most widespread use of photochemistry in industry. Photochlorination of hydrocarbons is of particular importance. The specific advantages of photochemical methods vs. thermal halogenation methods:

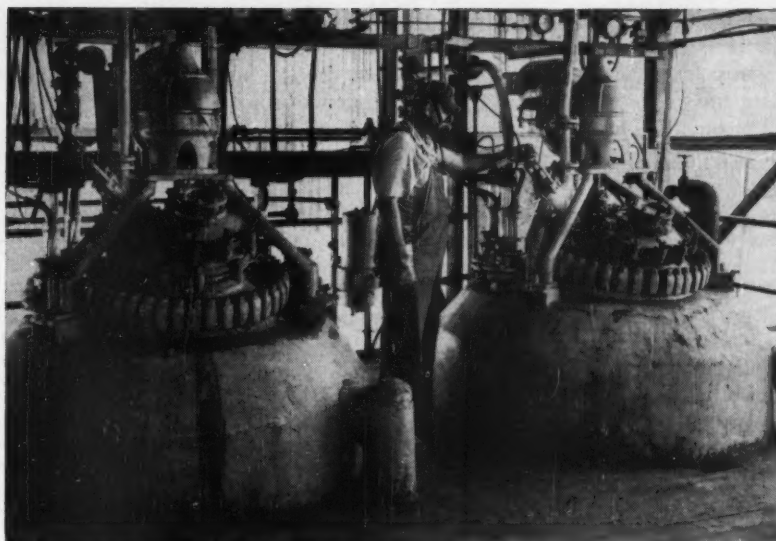
Photochlorination can be carried out at relatively low temperatures. This minimizes the possible combustion reaction that leads to the formation of carbon and HCl.

Using light may increase the yield of specific products, as in the chlorination of toluene. In this case, the use of light results in the side-chain substitution practically to the exclusion of substitution in the ring.

These important advantages are achieved at relatively slight increases in operating costs since the quantum yields are high. Also, conveniently available wavelengths are effective. One of the most interesting of the photohalogenations which have been developed is the chlorination of methane as described by Hirschkind.⁴⁴ (He notes that quantum yields of 30-90 are obtained in plant equipment.) Another is the chlorination of toluene on a plant-scale as described by Shearon, Hall and Stevens⁴⁵; and the manufacture of the gamma isomer of benzene hexachloride.^{47, 48, 49}

► **Hydrohalogenation**—Vaughn and Rust investigated hydrohalogenation with the aid of ultraviolet light. Hydrobromination of propylene to yield the primary bromide is done in the vapor phase using light of wavelength less than 3,000 Angstrom units.^{50, 51} Hydrohalogenations may also be carried out using light of wavelengths greater than 3,000 Angstrom units provided certain materials such as carbonyl compounds are present.⁴⁰

► **Sulphydration**—Vaughn and Rust also report success in photochemical sulphydration. The addition of hydrogen sulfide to end-olefins to form the primary mercaptan can be done in the presence of light of wavelengths



COMMERCIAL REACTORS for batchwise production of benzene hexachloride.

less than 3,000 Angstrom units,^{50, 51} or with light of greater wavelengths provided materials such as certain carbonyl compounds are present.⁴⁰ Other sulphydrations—such as that of diallyl ether to yield a linear polymer—have been reported as being very rapid in the presence of ultraviolet light.⁴²

There are several interesting possibilities for commercial development of sulphydration if relatively cheap end-olefins should eventually become available. Some of the newer hydrocarbon syntheses, such as Fischer-Tropsch, might accomplish this.

► **Sulfochlorination**—Irradiating a mixture of paraffin, sulfur dioxide and chlorine can cause sulfochlorination of the paraffin. High yields of sulfonyl chlorides were obtained with light of wavelengths 1,800 to 5,000 Angstrom units.^{52, 53, 54}

► **Polymerization**—Olefins can be polymerized with ultraviolet light initiating the chains. Use of ultraviolet offers the specific advantage that no fragments of initiating catalyst appear in the product.

One of the difficulties in applying this method is that of maintaining uniform conditions of illumination within a reacting mixture.

This problem is particularly difficult if you try to produce cast structures by photopolymerization. However, methods have been developed even for this difficult case.^{55, 56} Catalysts for use in photopolymerization

have been suggested.^{57, 58, 59}

The cross-linking of polyethylene by irradiation under high-energy cathode rays was reported recently.³ This treatment is claimed to contribute form stability at higher temperature and may lead to the possibility of manufacturing sterilizable containers for food and drugs.

► **Oxidation**—Reaction of oxygen and organic nitrogen compounds in the presence of a thiazine dye has been investigated.⁴⁶ Methylene blue and oxygen can be used with light of effective wavelength 6,700 Angstrom units to carry out the oxidation of nicotine. The oxidation of hydrogen chloride reportedly goes to completion at ordinary temperatures in the presence of sunlight.⁴

► **Photolysis**—As a possible source of hydrazine, the photolysis of ammonia has been of particular interest in recent years. Although yields as high as 57% (based on the ammonia decomposed) have been reported,^{18, 58} the conversion per pass in a flow system has been limited to 0.1%.⁶

Energy Considerations

One of the basic economic factors to be considered in any present or potential application of photochemistry is the cost of the radiant energy required. The factors which determine the amount of radiant energy required are best discussed in the con-

Energy Requirement to Initiate Photochemical Activation

Radiation	Wavelength, Angstrom Units	Cal./Gm.-Mole	Btu./Lb.-Mole	Kwh./Lb.-Mole	Electron-Volts
Near infrared.....	10,000	2.86×10^4	5.15×10^4	15.1	1.24
Far ultraviolet.....	1,000	2.86×10^5	5.15×10^5	151	12.4
X-ray.....	10	2.86×10^7	5.15×10^7	15,100	1,240
Gamma-ray.....	0.1	2.86×10^9	5.15×10^9	1,510,000	124,000

text of a general discussion of the energy terms involved in both thermal and photochemical reactions.

Here are some useful terms:

- The frequency of radiation is a defined quantity related to wavelength.

$$\nu = \frac{\text{speed of light, A./sec.}}{\text{wavelength, A.}}$$

$$\nu = \frac{2.998 \times 10^{18} \text{ A.-sec.}^{-1}}{\text{wavelength, A.}}$$

- The energy of a quantum depends on the frequency of the radiation.

$$\epsilon = h\nu$$

$$\epsilon = (6.62 \times 10^{-27} \text{ erg-sec.})\nu$$

- The energy of a gram-molecular-number of quanta is called an einstein.

$$E = (6.62 \times 10^{-27})(6.02 \times 10^{23})\nu$$

$$E = 39.8 \times 10^{-4} \text{ ergs.}\nu$$

$$1 \text{ cal.} = 4.18 \times 10^7 \text{ ergs.}$$

$$1 \text{ Btu.} = 252 \text{ cal.}$$

$$1 \text{ electron-volt} = 23,055 \text{ cal.}$$

By far the largest number of chemical reactions which are important in our technology are thermal reactions. These are the reactions that occur spontaneously when one or more reactants is heated to the proper temperature in the presence or absence of a catalyst. These reactions are usually carried out under such conditions that the energy changes which can be observed are restricted to heat effects and mechanical work. These energy changes are usually defined in terms of two defined quantities: internal energy and enthalpy.

The change in internal energy accompanying a thermal reaction is defined simply as the difference between the two energy effects that are observed.

$$\Delta E = Q - W$$

where ΔE is the increase in internal energy of the system; Q is the heat absorbed by the system; and W is the work done by the system.

When a reaction is carried out at constant volume, the work done by

system is zero and the internal energy change is equal to Q .

The change in enthalpy is given by:

$$\Delta H = \Delta E + \Delta(PV)$$

where ΔH is the increase in enthalpy of the system; P is pressure; and V is volume.

In addition to these two quantities we also speak of the activation energy of a thermal reaction. The quantity is merely a defined term and is related to the rate of a thermal reaction by equation:

$$(d \ln k)/dT = A/RT^2$$

where k is the reaction velocity constant; T is temperature; R is the universal gas constant; and A is activation energy. The activation energy is essentially a convenient way of expressing the effect of temperature on the rate of a chemical reaction.

To what extent do these defined energy terms apply to reactions which are initiated by radiant energy? Let's consider a single reaction carried out under conditions of constant pressure and temperature. We'll use thermal activation in one case and photochemical activation in another.

If we set the initial and final states of the system as being identical, then both ΔE and ΔH must be the same for both cases since internal energy and enthalpy are state properties. Furthermore, under these restrictions the mechanical work done in the two cases will be the same.

Thus, with regard to over-all energy effects we can write:

$$\Delta E = Q - W \quad (\text{Thermal})$$

$$\Delta E = Q' + r - W \quad (\text{Photochemical})$$

where ΔE , Q and W are as defined above; Q' is the heat absorbed by the system during photochemical reaction; and r = radiant energy absorbed by the system.

But since ΔE and W are identical for the two cases:

$$Q = Q' + r$$

This means simply that if heat must be supplied to the reacting system, the amount to be added to the photochemical system is r less than the heat to be added to the thermal system. In the case of an exothermic reaction (Q negative) the amount of heat to be removed from the system will be larger (by the amount r) for the photochemical system.

The amount of radiant energy which must be supplied in order to carry out a reaction is determined solely by the wavelength of the radiation used and the over-all quantum efficiency of the reaction.

In the table above we have indicated the energy required to initiate a reaction for a quantum efficiency of unity. The energy requirements will change in inverse proportion to the quantum efficiency of the conversion.

Commercial Processes

The photochlorination of toluene on an industrial scale is described by Shearon, Hall and Stevens.²⁴ The chlorination step is carried out on a batch basis in two 500-gal. glass-lined kettles. Each kettle is equipped with two 4-ft. 3,000-watt lamps in sealed borosilicate-glass tube walls.

Chlorine is fed to the kettle in series. At the beginning of a batch treatment, chlorine may be fed to kettle A containing partially-reacted toluene. The excess chlorine, HCl and some toluene from this kettle pass to kettle B which is charged with fresh toluene. After the material in kettle A has reached the desired stage of chlorination, the chlorine supply is cut off and product is removed. The cycle is then repeated.

In this particular case, pure reactants are required. The chlorine is vaporized and passed through a porous stone filter and a glass-wool filter in series. Iron removal must be thorough since small quantities catalyze the un-

desired ring substitution. The toluene (coal-tar source) is dried by azeotropic distillation.

The manufacture of benzene hexachloride is carried out by several companies using photochlorination of benzene. Although considerable information on this process is available from the patent literature,^{17, 20, 22} relatively little has been said about industrial operations.

Stauffer's plant for the production of benzene hexachloride (24% gamma isomer) is described in a recent issue of *Chemical Engineering* (Oct. 1954, p. 338). Little information about the photochlorination—other than the fact that it is a continuous process—is included. We believe that production of benzene hexachloride is carried out by both batch and continuous reac-

tions in the plants of several other companies. Purification of raw materials in this case again involves the removal of iron (to prevent formation of chlorobenzene) and the removal of oxygen. Oxygen will prevent the reaction from starting.

The gas-phase photochlorination of methane and the liquid-phase photochlorination of methylene chloride and chloroform are discussed by Hirschkind.²⁴ In contrast to the two processes discussed above which can be carried out only by photochemical activation, these chlorinations can be done either thermally or photochemically.

Hirschkind compares the two types of processes but no definite statement is made to indicate which one was used by Dow in 1949.

The Lummus Co. has recently described the Hoechst process²⁵ for the manufacture of methane chlorination products. It is suggested in this process—successfully used in Germany for the past 25 years—that the chlorination of methane be carried out by thermal activation and that carbon tetrachloride be made from methylene chloride and/or chloroform by photochlorination. Yields of 95% of theory are claimed for the photochlorination step.

These chlorinations represent, probably, the most important applications of photochemical activation in commercial use today. Other processes of interest include irradiation of sterol to produce vitamin D, the molecular rearrangement of citronellol to rhodinol and various polymerizations.

5. Energy and Over-All Cost Factors

In approaching the problem of whether photochemical activation is economically feasible in a given case, the first consideration is whether the desired product can be made in any other way. If so, the methods available (thermal, catalytic, photochemical) must be compared on the basis of the several cost factors involved in each of them.

If no other method is available, the photochemical method must be evaluated economically to determine whether costs are such that the product can be put on the market at a reasonable price. In either event the factors of prime importance are:

- Pilot plant costs.
- Capital costs.
- Operating costs.

Basic cost data for plants using photochemical activation are almost completely lacking in published sources. This is a natural result of the present state of development in the field.

In general, pilot plant costs are high. Partly because of certain inherent characteristics of photochemical activation, but also because of a lack of knowledge of basic design factors. Capital costs may also be relatively high, partly because of the rather specialized nature of each application.

Operating costs for photochemical methods include energy costs (discussed in the previous section) and maintenance costs peculiar to the use of glass and quartz on a large scale.

In the present state of knowledge of engineering aspects of photochemical activation, it is to be expected that the method will be ruled out in many

Sample Problem

Consider the chlorination of chloroform:



The enthalpy change accompanying this reaction at 18 C. and the internal energy change are the same in this case, 25,000 cal./gm.-mole. The activation energy for the thermal reaction is somewhat difficult to state since a chain mechanism is involved. We can consider it to be of the order of 30,000 cal./gm.-mole.²⁶

Light of 4,000 Angstrom units wavelength is effective in initiating the reaction. The quantum efficiency is of the order of 50 in industrial-scale equipment. Assume an efficiency of 10% in the conversion of electrical energy into light energy of the proper wavelength.

cases by the excessive costs and time requirements of pilot-plant programs. This situation will change if the commercial applications of photochemical activation reach a point which makes essential the development of the basic data and techniques needed to shorten pilot-plant programs and to decrease capital and operating costs.

Solution—The energy of a gram-molecular-number of quanta is:

$$E = \frac{(39.8 \times 10^{-4})(2.998 \times 10^{10}) \text{ cal.}}{4,000(4.18 \times 10^7)}$$

$$E = 71,400 \text{ cal.}$$

Radiant energy to be supplied per gm.-mole reacted is:

$$71,400/50 = 1,428 \text{ cal.}$$

Radiant energy to be supplied per lb.-mole reacted:

$$1,428(1.8) = 2,570 \text{ Btu.} = 0.755 \text{ kwh.}$$

Electrical energy required to produce radiant energy:

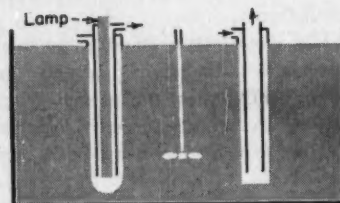
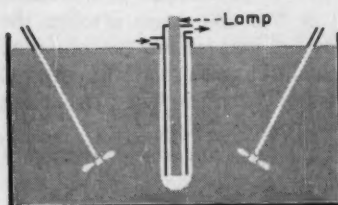
$$0.755/0.10 = 7.55 \text{ kwh.}$$

At \$0.02 per kwh., the cost of light for activation is:

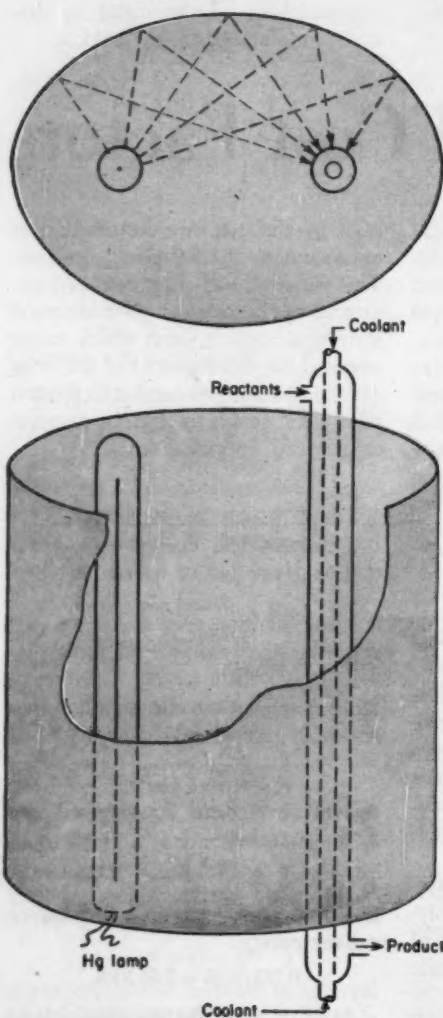
$$(7.55)(0.02)/154 = \$0.001/\text{lb. of CCl}_4$$

Next step is to lay out a reactor system →

6. How to Lay Out a Photochemical Batch . . .

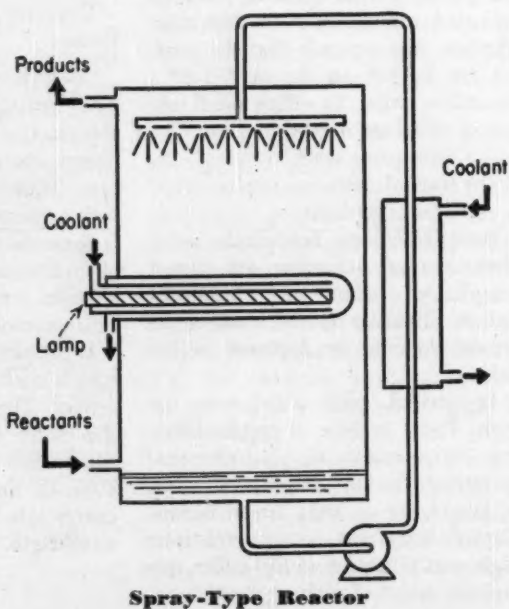
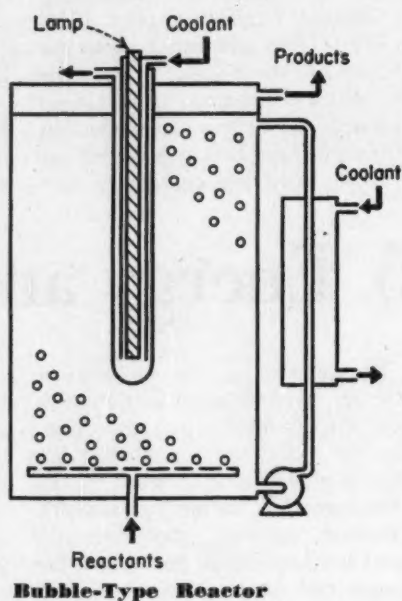


Continuous . . .

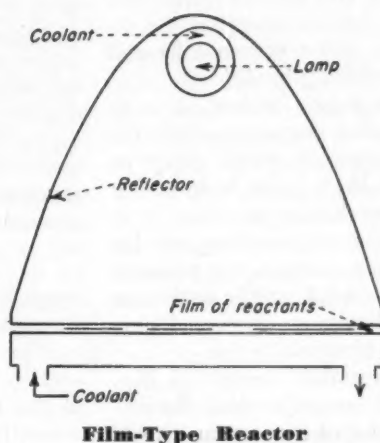
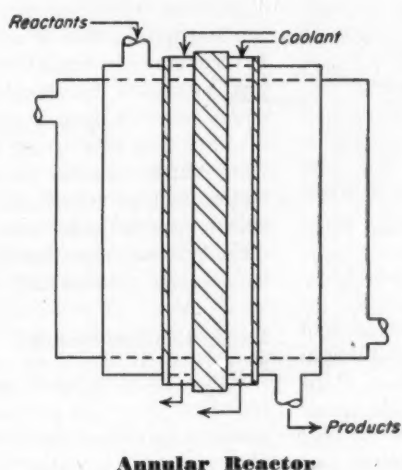
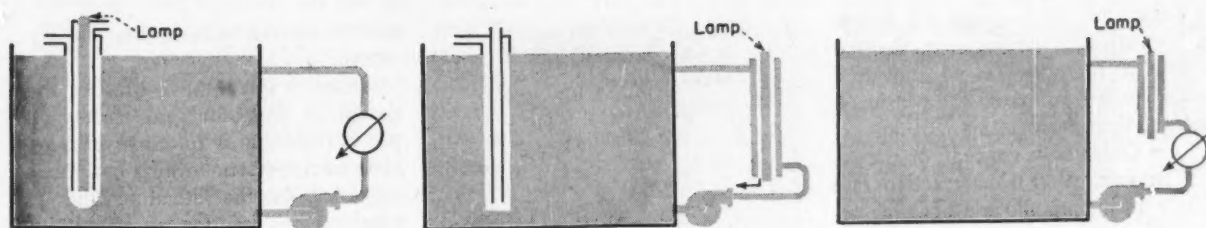


Elliptical Reactor

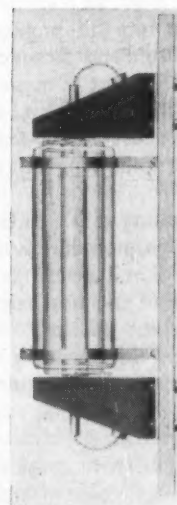
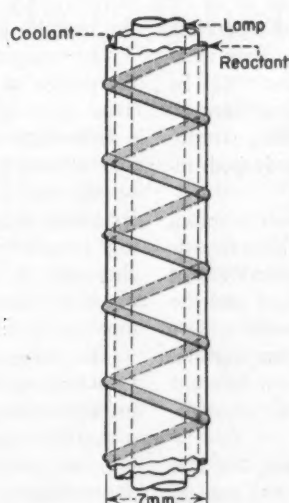
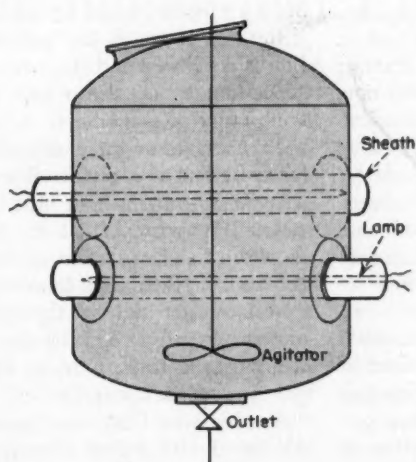
With reactant tube at one focus and lamp at the other, elliptical reflector gives maximum utilization of radiant energy.



Reactor System



Today's Trend Is . . .



. . . From Batch Reactors to . . .

. . . Continuous Irradiators

6. How to Lay Out a Photochemical Reactor System (continued)

SELECTION and design of equipment for carrying out thermal chemical reactions on an industrial scale involves primarily the consideration of these factors:

- Order of magnitude of the reaction rate. Very slow reactions are likely to dictate the use of batch reactors and very rapid reactions the use of continuous reactors. Although the reaction rate can be varied over considerable ranges—particularly by the use of catalysts or by change in the temperature and pressure—there will be rather definite limits on the reaction rate under economically and technically feasible conditions.

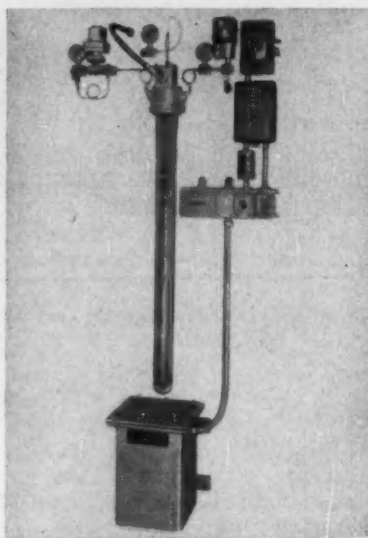
- The phases involved. If a reaction involves gaseous reactants, the size of equipment which would be required is likely to be so large that resort to continuous processing is required. Reactions involving only liquid and solid reactants and products, on the other hand, may be carried out either batchwise or continuously in equipment of reasonable size.

- Temperature control. If large heats of reaction are involved, the cooling or heating of the reacting mass to prevent excessive variations in temperature may become a major problem in design. Adequate temperature control can be achieved using either batchwise or continuous processing.

- Materials of construction. Those used for the construction of a reactor must be chosen so as to be suitable for the proposed operating temperature and pressure. They must also be resistant to corrosive attack by the reacting stream and must have no adverse effect on the reacting stream, such as catalyzing an undesired reaction.

In dealing with a particular reaction the design procedure would ordinarily involve simultaneous consideration of the rate of chemical reaction and the rate of heat transfer for various combinations of operating temperature, pressure, catalyst properties, reactant mixture composition, and construction materials.

In addition to considering the rate of chemical reaction and the rate of heat transfer, we must also consider the rate of transfer of radiant energy, usually in the form of visible or ultra-



IMMERSION ASSEMBLY for photochemical reactors (Hanovia).

violet light. The requirement of light transmission places severe limitations on the choice of construction materials and usually results in the choice of glass or quartz to separate the light source from the reacting stream.

This choice in turn limits the range of operating temperatures and pressures which can be used. Furthermore, it complicates the problem of heat transfer since both glass and quartz are materials of relatively low thermal conductivity and since the use of high intensity light sources requires that the heat be removed from the lamp.

The complex problems involved in the design of photochemical reactors have received very little attention, a fact which merely reflects the limited uses of photochemical activation in industry. The availability of better light sources and a continually-increasing knowledge of the fundamental chemistry of the field should lead to much broader applications and to more study of reactor design.

The present status of the published knowledge in this field is illustrated by the very fragmentary information that is available on the effect of flow pattern on conversion in a continuous photochemical reactor. Although the importance of turbulence in securing high reaction rates is realized^{24, 25, 26} essentially nothing of a fundamental

nature on this subject has yet appeared.

Although quantitative data for the design of photochemical reactors is not available, it is informative to review reactor systems which have been suggested in the literature and to combine this information with some speculation as to possible reactor systems. Such a review will serve as a general guide in selecting a reactor system for a particular application. The review which follows is based on the assumption that it will probably be economically feasible to produce light sources of cylindrical shape and design other equipment around these—rather than attempting to produce light sources in other shapes. Other shapes, such as helical coils are available on special order now but it is difficult to visualize that such shapes will become commercially important.

Batch Reactor Systems

Batch photochemical reactors are indicated when the production scale involved is small or moderate and the phases involved are either liquid alone or liquid plus gas (gas being added as the reaction progresses).

A common design for a batch reactor is shown in the first batch reactor sketch on p. 174. A single assembly is immersed in the reaction vessel and serves to furnish light and control the temperature of the reaction mass. Such a scheme would be useful only if the rate at which the heat of reaction is developed and the rate of heat generation by the lamp were of the same order of magnitude.

In many cases these values are so far apart that it is not feasible to use a single coolant for both heat transfer tasks. It's apparent that the scheme shown in this first sketch requires that the heat of reaction be transmitted to a heat transfer material through glass or quartz. And the heat transfer material must be transparent to light of the required wavelengths.

Furthermore, the mechanical assembly of such a unit is complicated enough that taking it apart for cleaning may be difficult. The batch reactor shown in the second sketch represents some possible improvements

in that the functions of cooling the lamp and transferring the heat of reaction are now separated. In this design the heat of reaction can be transferred through a wall of higher thermal conductivity since transparency of this wall is no longer required.

The use of batch systems with external recirculation lines—in which are located heat exchangers, irradiation units or both—offer also the possibility of separating the light supply problem and the temperature control problem (see page 175).

In none of the cases shown is it required that the heat of reaction be transmitted through the light-transmitting wall.

Continuous Systems

Continuous photochemical reactors are indicated for vapor-phase reactions even for low production rates and for liquid or mixed phase reactions if the production rate is high.

Continuous reactors in which the reacting stream is contained in an annular space are shown on p. 175. In some designs the heat generated by the lamp and the heat of reaction must be transferred to a single fluid and the heat of reaction is transferred through a wall of glass or quartz.

These difficulties can be overcome by the arrangement shown in the left-hand sketch. Here the heat of reaction

is transferred through the outer wall of the annular space in which the reaction occurs. This wall can be made of a material of high thermal conductivity since light transparency is not required. However the assembly shown would necessarily be complicated.

The right-hand sketch shows a photochemical reactor in which the reaction occurs in a thin film of flowing liquid. It is particularly useful in the irradiation of opaque liquids. The irradiation of milk is the most common example of the type of process in which this design is useful. Such units have been used also for the sterilization of water, where the liquid may be effectively opaque because of the presence of suspended matter.

A more reasonable method of separating the functions of light transmission and of transferring the heat of reaction would be an elliptical arrangement as shown on p. 174. In this case a light source is placed at one focus of an elliptical cylinder and a reactor tube at another focus. The lining of the elliptical cylinder is made of a material which efficiently reflects light of the proper wavelengths. In this kind of reactor with a perfect reflector, essentially all of the light generated should reach the reactor.

In this case the separation of the two units is achieved very simply, and complicated mechanical structures are avoided completely.

The use of an inert liquid to aid in the control of temperature of a vapor-phase reaction—using either a continuous or discontinuous liquid phase—has been suggested. Use of continuous liquid phase would lead to a bubble-type reactor in which the inert liquid would have to be transparent to the light used. Use of a discontinuous liquid phase would lead to a spray-type reactor. If the density of the spray were not excessive, it would not require a transparent liquid.

Development Needed

It would be difficult to guess in what direction the development of photochemical reactors will go as the field expands. The problems involved in developing reactors are optical, chemical and mechanical.

If any of the schemes outlined above are developed for large-scale operation it will probably be necessary to use continuous reactors in which several light sources and several reaction tubes might be contained in a single unit. The mechanical problems here would certainly be formidable although certainly solvable.

The ultimate answers to demands for photochemical reactors could lie in one of the schemes depicted here or in some less obvious scheme such as vapor-phase reaction in the presence of a fluidized bed of phosphor.

Photochemical Engineering: What's Ahead?

The future of industrial photochemistry is particularly difficult to predict at the present time, partly because of uncertainty regarding certain technical factors. An even more important factor in such predictions, however, is the question of how soon further development will be needed.

Should an acute need arise for the development of industrial photochemistry for applications involving synthesis of relatively simple materials or of the complex molecules that represent fuels or foods, there is little doubt that very rapid progress could be made.

The technical advances which we can reasonably expect to occur within the next few years include improve-

ments in radiation sources, a better understanding of the mechanisms of photochemical reactions and of the effects of promoters on them as well as an improved knowledge of the factors that govern the design of photochemical reactors.

With regard to sources of ultraviolet radiation, it would appear that mercury lamps will continue to be of greatest importance. Improvements in performance and in the variety of types of mercury lamps available have been quite marked during the past few years and may be expected to continue—perhaps in smaller degree.

Another portion of the electromagnetic spectrum which may become

important in photochemistry in the future is the gamma-ray region. The development of economically feasible sources of this radiation appears to depend on the general field of atomic energy and more specifically on developments in disposal of radioactive wastes.

Further progress in the development of light sources would be greatly aided if we were able to utilize visible light in photochemistry. This would permit the use of several sources of artificial light and possibly of sunlight. How can visible light be rendered effective in photochemistry? We might be able to answer this question if we knew more about the functions

of promoters in photochemical activation.

We pointed out above that the presence of chlorophyll in plants is responsible for rendering visible light effective in photosynthesis. Vaughn and Rust report that the presence of certain carbonyl compounds in reacting mixtures makes it possible to use light of wavelengths above 3,000 Angstrom units for cases which require shorter wavelengths in the absence of these compounds.

The development of fundamental knowledge regarding the factors which govern the design of photochemical reactors is a particularly challenging field. Such developments will require an understanding of photochemistry, optics, flow patterns, etc. The lack of knowledge of design fundamentals at the present time is a reflection of the fact that most reactions involve a small-production scale or the irradiation of opaque liquids.

This leads in one case to batch reactors and in the other to rather highly specialized equipment. More recent developments, such as the production of benzene hexachloride, have required the development of continuous reactors.

What fields can photochemistry be expected to find application in the future? The specificity of photochemical activation can be expected to lead to extension of its application in the synthesis of relatively simple organic compounds in the fields of medicinals, insecticides, etc.

Perhaps the most dramatic possibilities for development of industrial photochemistry are those relating to vastly improved methods of using sunlight in the production of foods. The mass culture of green algae as a potential food source has been carried through the pilot-plant stage in a program by the Carnegie Institution and Artur D. Little, Inc. This process is believed to be capable of producing from one acre of culture about 25 to 35 tons of dry product annually. The dry material is reported to contain about 50% protein and 20% fats and to be the nutritional equal of yeast.

The role of radiation in helping solve food supply problems is, however, considerably broader than its use in food synthesis. Photochemistry is used extensively in the vitamin enrichment of foods—especially in vitamin D enrichment of milk—and in the

synthesis of insecticides which function to increase our food supply.

The general problem of energy sources of the future has led to much consideration of more efficient ways of using the sun's energy. Among the methods proposed is the more efficient use of sunlight in the photosynthesis of combustible materials that could be used as fuels. Other more direct methods have also been suggested, such as the direct conversion of the sun's energy into electrical energy by means of a solar battery.

CREDITS

The authors wish to acknowledge the assistance of many individuals and companies. In particular they express gratitude to Dr. Robert Patrick, Staff Scientist Quantum, Inc., and to James E. Huff.

Acknowledgement is due to the following individuals: W. T. Anderson, C. Arnold, E. W. Beggs, R. Bell, H. Bender, O. H. Biggs, L. J. Buttolph, R. H. Dalton, F. Domino, D. F. Gould, O. W. Greene, R. Heitz, T. F. Holder, A. Hollaender, B. J. Humphrey, C. E. Inman, R. Landau, F. E. Lawlor, J. J. Lukes, F. Miller, J. Neal, E. W. Neben, M. E. Nordberg, R. Obrecht, S. C. Peek, T. C. Sargent, E. B. Shand, M. J. Skeeters, W. Swanton, L. Symonson, W. S. Till, E. W. Voegtlin, W. R. Walker, D. Wilde and P. Weiss.

In addition, the assistance of the following companies is acknowledged: Borden Co., Philadelphia; Carbide and Carbon Chemicals Co., New York; Columbia-Southern Chemical Corp., Pittsburgh; Corning Glass Works, Corning, N. Y.; Dawe's Labs, Chicago; Diamond Alkali Co., Painesville, Ohio; Dow Chemical Co., Great Western Div., Pittsburg, Calif.; E. F. Drew Co., Boonton, N. J.; General Electric Co., Nela Park, Ohio; Hanovia Chemical & Mfg. Co., Newark, N. J.; Hoechst Farbwerke, Frankfurt, Germany; Humble Oil & Refining Co., Baytown, Texas; Humphrey-Wilkinson, Inc., North Haven, Conn.; Lummus Co., New York; McGraw-Hill Book Co., New York; National Oil Products Corp., Harrison, N. J.; Pennsylvania Salt Manufacturing Co., Wyndmoor, Pa.; Pfaunder Co., Rochester, N. Y.; Scientific Design Co., New York; Standard Oil Development Co., New York; Stauffer Chemical Co., Los Angeles, Calif.; Sylvania Elec-

tric Products, Inc., Salem, Mass.; Westinghouse Electric Products Corp., Bloomfield, N. J.; and The National Research Council, Washington, D. C.

REFERENCES

1. Allmand, A. J. and R. G. Franklin, *J. Chem. Soc.*, 2,073 (1930).
2. Anderson, W. T., Jr., *Ind. & Eng. Chem.*, 30, 844 (1947).
3. Asinger, F., W. Schmidt and F. Ebeneder, *Berichte*, 75B, 34 (1942).
4. Asinger, F., F. Ebeneder and E. Bock, *Berichte*, 75B, 42 (1942).
5. Asinger, F. and F. Ebeneder, *Berichte*, 75B, 344 (1942).
6. Audrieth, L. F. and B. A. Ogg, "The Chemistry of Hydrazine," John Wiley & Sons, Inc., New York (1951).
7. Baginski, F. C., D. Eng. Dissertation, Yale University (1951).
8. Calfee, J. D. and L. B. Smith, U. S. Pat. 2,566,163 (Aug. 28, 1951).
9. *Chem. and Eng. News*, 32, 1,342 and 1,392 (1954).
10. Cooper-Hewitt Electrical Co., "High Intensity Germicidal Lamp."
11. Daniels, F., *American Scientist*, 38, 521 (1950).
12. Gadsby, J. and A. L. L. Tompsett, U. S. Pat. 2,525,664 (Oct. 10, 1950).
13. Gedy, G. R. and E. K. Rideal, *J. Chem. Soc.*, 1,160 (1932).
14. General Electric Co., "Ultraviolet Air Sanitation."
15. General Electric Co., "Fluorescent Lamps (Engineering Data)."
16. General Electric Co., "Photochemical Uvlar Lamps."
17. Gonze, M., U. S. Pat. 2,524,970 (Oct. 10, 1950).
18. Gorislavets, I. O., *J. Phys. Chem.*, 17, 102 (1943).
19. Governale, L. J., J. H. Huguet and C. M. Neher, U. S. Pat. 2,589,689 (Mar. 18, 1952).
20. Hanovia Chemical & Mfg. Co., "The Sc 2,537 Lamp."
21. Hanovia Chemical & Mfg. Co., "Radiation Data for Hanovia High Pressure Mercury Quartz Lamps."
22. Hanovia Chemical & Mfg. Co., "Technical Data for Compact Type Xenon Lamps."
23. Herold, P., K. Smeykal, F. Asinger and W. Wolf, U. S. Pat. 2,352,097 (June 20, 1944).
24. Hirschkind, W., *Ind. & Eng. Chem.*, 41, 2,749 (1949).
25. Kahn, A. and H. E. Gunning, *J. Chem. Phys.*, 18, 392 (1950).
26. LaLande, W. A., M. E. Aeugle and G. Molyneux, U. S. Pat. 2,569,677 (Oct. 2, 1951).
27. Luckiesh, M., "Applications of Germicidal, Erythral and Infrared Energy," D. Van Nostrand Co., Inc., New York (1946).
28. Naamloze Vennootschap de Bataafse Petroleum Maatschappij, British Pat. 660, 072 (Oct. 31, 1951).
29. Noyes, W. A., Jr., and P. A. Leighton, "The Photochemistry of Gases," Reinhold Publishing Corp., New York (1941).
30. Roberts, J. B., et al., U. S. Pat. 2,528,320 (Oct. 31, 1950).
31. Sachs, C. C. and J. Bond, U. S. Pat. 2,505,067 (Apr. 25, 1950).
32. Sachs, C. C. and J. Bond, U. S. Pat. 2,505,068 (Apr. 25, 1950).
33. Sachs, C. C. and J. Bond, U. S. Pat. 2,548,685 (Apr. 10, 1951).
34. Shearon, W. H., Jr., H. E. Hall and J. E. Stevens, Jr., *Ind. & Eng. Chem.*, 41, 1,812 (1949).
35. Taylor, H. A. and W. E. Hanson, *J. Chem. Phys.*, 7, 418 (1939).
36. Vaughan, W. E. and F. F. Rust, *J. Org. Chem.*, 7, 472 (1942).
37. Vaughan, W. E. and F. F. Rust, *J. Org. Chem.*, 7, 477 (1942).
- 38-42. Vaughan, W. E. and F. F. Rust, U. S. Patents 2,307,552 (Jan. 5, 1943); 2,398,479 and 2,398,481 (Apr. 16, 1946); 2,522,589 and 2,522,590 (Sept. 19, 1950).
43. Well, L., U. S. Pat. 2,543,817 (Mar. 6, 1951).
44. White, A., U. S. Pat. 2,524,862 (Oct. 10, 1950).
45. National Research Council, Edited by A. H. Hollaender, "Radiation Biology," Vol. II to be published by the McGraw-Hill Book Co., Inc., New York early in 1955.
46. Granath, *Phys. Rev.*, 34, 1,045 (1929).
47. The Lummus Co., "The Hoechst Process for the Production of Methane Chlorination Products," New York (1954).

Can You . . .
Could You . . .
Should You . . .

Specialize

. . . For Money
. . . For Prestige
. . . For Satisfaction

HUGH T. SHARP

Specialists, experts in a particular segment of technology, have long been the bellwethers of American industry. From the specialist and from teams of specialists have come virtually all of our technical achievements. But recently, with the advent of the "generalist," the professional manager, the career of specialist is slipping out of vogue.

Young engineers are rarely advised to specialize nowadays. Instead, they are urged and educated to "get into management" at all costs. Opportunities for professional and personal growth in a technical specialty have been bypassed in favor of growth into a management post. For some this is a wise choice; for many others it's all wrong.

Movement of engineers into executive slots is to be applauded and encouraged, but top-notch technical specialists are vitally needed, too.

For the individual engineer it adds up to an important decision. He must pick the path he should follow—to management or to technical expertness. This decision has a deep and lasting effect on a career; it calls for a good deal of soul-searching. Stakes are high. The prize for making the correct choice is a happy successful career.

Know the Requirements of the Job

Can You Specialize?

Not everybody has what it takes to be a specialist—a good one. The little boy who was proud because he alone could read his handwriting was not necessarily a specialist. Owning an impressive skill, even if it's exclusive, does not immediately qualify one as a specialist—though it's certainly a part of the picture.

The top rank engineering specialist has an insatiable curiosity and an unquenchable enthusiasm for his field. Sound frightening? All it boils down to is that some of

us have a hell of an itch to learn all there is to know about a subject, and these people make the best specialists.

For contrast, there's the generalist. His curiosity bump takes a different shape. While he likes to keep up-to-date and know what's going on in an engineering field, he ordinarily refrains from wading into the details. To the generalist, distillation is a step in the process; to the specialist in that field, it's a fascinating welter of equilibrium constants, transfer units, tray efficiencies, vapor velocities, diameters and heights.

Not that the generalist does not see or does not understand such details. Interest in details is not a point of difference, since the generalist may be every bit as meticulous as the specialist.

But they differ in perspective. The specialist foregoes the broad problems of the generalist for his just as absorbing, though more restrictive, posers.

This difference in perspective deserves much consideration in your decision. How do you view your present work? From what vantage point?

Another major variance between the two is also apparent. The engineering specialist deals principally with things, while the generalist works mainly with and through people—directing their efforts.

The average engineer is usually more adept at the former. His natural bent and his engineering training orient him in that direction, and the current flood of management training courses and books and articles dealing with all phases of human relations and management is admissible evidence that he is only reoriented with difficulty.

Most companies report that it is relatively easy to help their engineers gain the necessary background in economics and business to qualify for executive responsibilities. But they consider it extremely difficult to teach them to understand and lead people. And it's the latter which gains in importance as they climb into management.

In a recent survey of chief engineers (*Chem. Eng.*, Oct. 1953, p. 284) nearly all respondents indicated a desire to

HUGH SHARP edits *CE's* popular *You and Your Job* department.

"Things will be better done when each man is free from the distractions of other occupations to do the job for which he is best fitted and do it when it should be done."

—Socrates, 5th Century B. C.

learn more about human relations. They called this the biggest part of their jobs.

These then are basic differences in the work of the specialist and the generalist.

Could You Specialize?

For the young engineer, some degree of specialization is inescapable. It's part of the scheme of things in industry that he become proficient in certain areas of engineering.

He is well equipped for such a role. As we've noted above, he is usually oriented toward things, not people. And his education has involved the details of the specialist rather than the perspective of the generalist.

From here the engineer has his choice. He is not yet sufficiently wrapped up in a single engineering specialty to be considered an expert, nor has he been trained for management, and the directing and coordinating of other's efforts. But he'll find plenty of opportunities in either direction.

An acute shortage of men ready and able to take on management duties and a need for qualified and recognized specialists are cries heard throughout the chemical industry. Just check the want-ads. You'll find that the emphasis is either on administrators or on a specific man (a specialist) for a specific engineering job.

As companies grow and become more complex, more specialties and more specialists are needed. Staff positions are created to bring experts to grips with company problems. Use of the task force approach to solving research, engineering and business problems has proved highly successful, and, in consequence, has increased the need for specialists.

By the same token, the increasingly technical nature of industry puts the administrator not trained technically under a growing handicap. Thus further opening up management to the engineer.

It is apparent, then, that opportunities lie on either path.

But no matter which direction is picked, additional training will be necessary. To enter management, skill in human relations and knowledge of business and economics must be gained. To specialize, knowledge of previous work in the field must be acquired, along with proficiency in the engineering and mathematical operations used.

An engineer with aspirations in either direction should begin preparing as early as possible. Management-minded men should seek wide, diversified experience and knowledge.

The knowledge is readily available for the seeking, but

the proper experience is generally more difficult to come by. If you elect to generalize and if you can make a good case for yourself, the most direct approach is probably the best one. Go to management, state your case and request the opportunity to broaden your usefulness to the company. If the answer is "No" you can either stay until "Chance" brings the experience or look elsewhere.

How are specialists developed? Obviously, they have to begin to learn all they can about the field. But it is also important to study related topics. While a specialist ordinarily doesn't need the perspective of the executive, he'll do a better job if he knows where and how his specialty meshes with others. And a rare and valued jewel is that specialist who can combine the perspective needed by a top executive with the expertness of a technical authority.

Should You Specialize?

There is no sense in getting into a career for which you either aren't fitted or which you don't like. Yet people do it every day. It's been said that the easiest way to wreck a man's career is to promote him—into the wrong job. Another good way to wreck him is to take a man with many interests and restrict him to one.

There are plenty of examples in industry, some, perhaps, in your own company, of inept managers who might have become widely recognized authorities on a specific topic; or of unspectacular specialists who could have had climbed high on the management ladder.

Before making a decision, many factors must be weighed. Your own interests, abilities, training and objectives must be balanced against the character of each type of work.

How do you rate your

- Interests—Does just about everything interest you, or are you more selective? Do you prefer to concentrate on a particular phase of a job, or do you find yourself intrigued with the whole job—all phases, all ramifications?

- Abilities—How do you rate on human relations? Are you able to direct and coordinate the work of others? Do you like to do that? How much of a leader are you? How good a technical man are you? How adept are you at the assimilating and digesting new engineering and mathematical techniques?

- Training—What type of training have you already had? What opportunities do you have for further development? What added training are you willing to take?

- Objectives—Where do you expect to be in 10, 20, 30 or 40 yr. from now? How much do you expect to be making? How high do you aim to rise in your profession?

After answering these questions and others which you've

probably thought of, you're in better shape to decide. But first, you should . . .

Know What the Rewards Are

Specialize for Money

If it's money you're after, you have to state your goals. Starting salaries are higher for specialists than for non-specialists. Early in the game raises come to the specialist fairly rapidly. Before too many years, however, the generalist, in management, begins to outpace the specialist.

Ordinarily, the generalist has the opportunity to reach a higher salary level than the specialist. Corporate pay structure has been likened to a truncated pyramid surmounted by an obelisk—pay to top executives makes up the obelisk.

The specialist, on the other hand, is almost sure to find that there is a ceiling on his financial progress. Ordinarily, he is assured of financial security, but he rarely has the financial prospects of the executive.

There is evidence that management is coming to realize the plight of the specialist, and is jacking their salary ceilings higher. But while the first-rank specialist rarely reaches the top income brackets, he can usually count on a comfortable income. As one research director describes his staff's status, "None of us make any real money, but none of us starve either."

For the first-class specialist, there is always the possibility of entering the consulting field. This is not easy to do, but once established, a top-notch specialist can make a fine living. To do well, though, it is important that the specialist have a well-established reputation in his field.

This brings us right into another type of reward for the specialist.

Specialize for Prestige

Prestige is probably the prime reward of the specialist. His reputation grows as he excels in his specialty, and his fame is not limited to his department or company.

Through publications and papers delivered at meetings, he becomes known both to other specialists in his field, and often to workers in other fields as well. Naturally, within his company he is recognized as an authority and sought for advice and counsel.

Of course it's true that you can't eat prestige—but it is valuable. First-rank authorities in any engineering specialty are rarely surplus items. They carve for themselves a job security unmatched by the non-specialist.

Not too long ago young boys were often advised, "Learn a trade and you'll always be able to find work." Security-minded young engineers might well be counseled to excel in a specialty for about the same reason.

Specialists are relatively unaffected by company re-

organizations, mergers, office politics and the like, while the executive is more vulnerable. He is often less sure of his job—present and future.

The generalist, too, counts prestige as one of his compensations. His advancement in the company is usually recognition of his competence in management. In most cases, however, his renown is quite limited—restricted to his company or even to his department.

It's rather suggestive of that overworked fish-in-the-pool analogy. The specialist aiming to be a big fish in the relatively small pool of his specialty; the generalist content to be a relatively small fish in a bigger, richer pool.

But it takes more than money and prestige to reward a man for a job.

Specialize for Satisfaction

Specialists have the satisfaction of doing work which they like and in which they excel. Since two industrial problems are rarely alike, working in a narrow field need not be dull or repetitious as is often thought. There are no dull specialties, only dull people.

No matter how prosaic the field it holds a few surprises for those who'll look for them, you can be sure of that. There is hardly an engineering specialty which has not at one time or another been considered thoroughly studied and in which great strides have not been made since that judgment.

In his specialty he has both the opportunity and the incentive for original personal achievement. He is not tightly bound by the ties of "harmonious conformity" which have all but strangled many potentially creative men. Conformity is all well and good—up to a point. The specialist should be able to get along with people, be able to see beyond his field and grow socially as well as professionally. But conformity has become almost a fetish with many corporations. In his field the specialist has "room to breathe"—room to question, and even to oppose, current theory and practice.

He has the personal satisfaction of being able to be original, in contrast to the results of a recent survey in *Fortune* which showed that management prefers it's men to be "adaptable"—not original.

There are satisfactions to the generalist's job, too. He works with big, broad, challenging problems. Routine is a thing of the past. He meets new problems, new ideas, new contacts every day.

Successful executives take pride and satisfaction from the growth of their companies, and the realization that they made some of the decisions which spurred that growth.

All these are points worthy of your consideration.

The decision of whether to specialize or generalize is up to you. You have to think it out. You have to weigh one versus the other. You have to decide what you want. And then you have to do the work, that will get it for you.

"Blessed is he who has found his work; let him ask no other blessedness."

—Thomas Carlyle, 19th Century A. D.

Nomographs for Easy Estimating

Here are charts designed to give you a quick answer to the question—how difficult will it be to separate two components by distillation?

F. RODRIGUEZ

NOMOGRAPHS can be very useful for rapidly estimating the difficulty of separating two components by fractional distillation, under a variety of conditions.

Certain simplifying assumptions have to be made, but the estimate can be useful in preliminary design work, where such calculations must be made on a very small amount of experimental data.

Equilibrium Relationships

For instance, suppose the only information available is the vapor pressure-temperature behavior of each pure substance. Raoult's and Dalton's laws can be used to get the relative volatility and also the equilibrium curve for vapor-liquid mixtures.

Raoult's law¹ states that, in a mixture of liquid and vapor, "the partial pressure of any component will equal the vapor pressure of that component in the pure state times its mole fraction in the liquid mixture." Dalton's law² states that the "total pressure in a gaseous system is equal to the sum of the partial pressures of the components present."

Combining these two laws gives the equation

$$y_a \pi = x_a P_a$$

where y_a and x_a are the mol fraction of component A in the vapor and liquid respectively at equilibrium, P_a is the vapor pressure of pure A at the given temperature, and π is the total pressure in the system.

Nomographs can be set up to handle these various expressions, so that

the total time for estimation of the difficulty of a separation under varying pressures can be kept at a minimum. For a binary system,

$$y_a/1 - y_a = P_a/P_b(x_a/1 - x_a) = \alpha(x_a/1 - x_a)$$

where α , the relative volatility is then equal to P_a/P_b and is also a function of temperature.

Furthermore, if complete vapor pressure-temperature data is lacking, the Clausius-Clapeyron equation can be utilized to estimate the curve from only two vapor pressure-temperature points. This relationship is usually followed fairly well by most organic compounds at low pressures. The equation is³

$$\log_{10} P = \frac{-\Delta H_v}{2,303R} \left(\frac{1}{T} \right) + C$$

Where

P = vapor pressure in atmospheres.
 ΔH_v = heat of vaporization, cal./mole
 R = gas constant,
 1.987 cal./mole/°K
 T = temperature, °K.
 C = a constant, dependent on units of P .

Application of Trouton's Rule

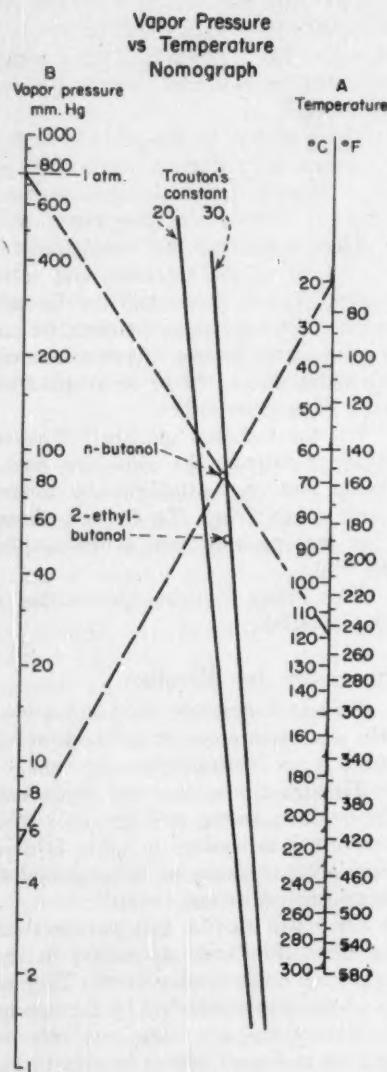
In the event that the boiling point at only one pressure is known, Trouton's rule can be called into play. This is⁴

$$\Delta H_v/T_b = C'$$

Where ΔH_v is the same as before, T_b is the boiling point at one atmosphere in °K, and C' is a constant equal to around 20 for some low molecular weight organic compounds. And around 30 for many of higher molecular weight such as C_6-C_{12} aldehydes, acids, and alcohols.

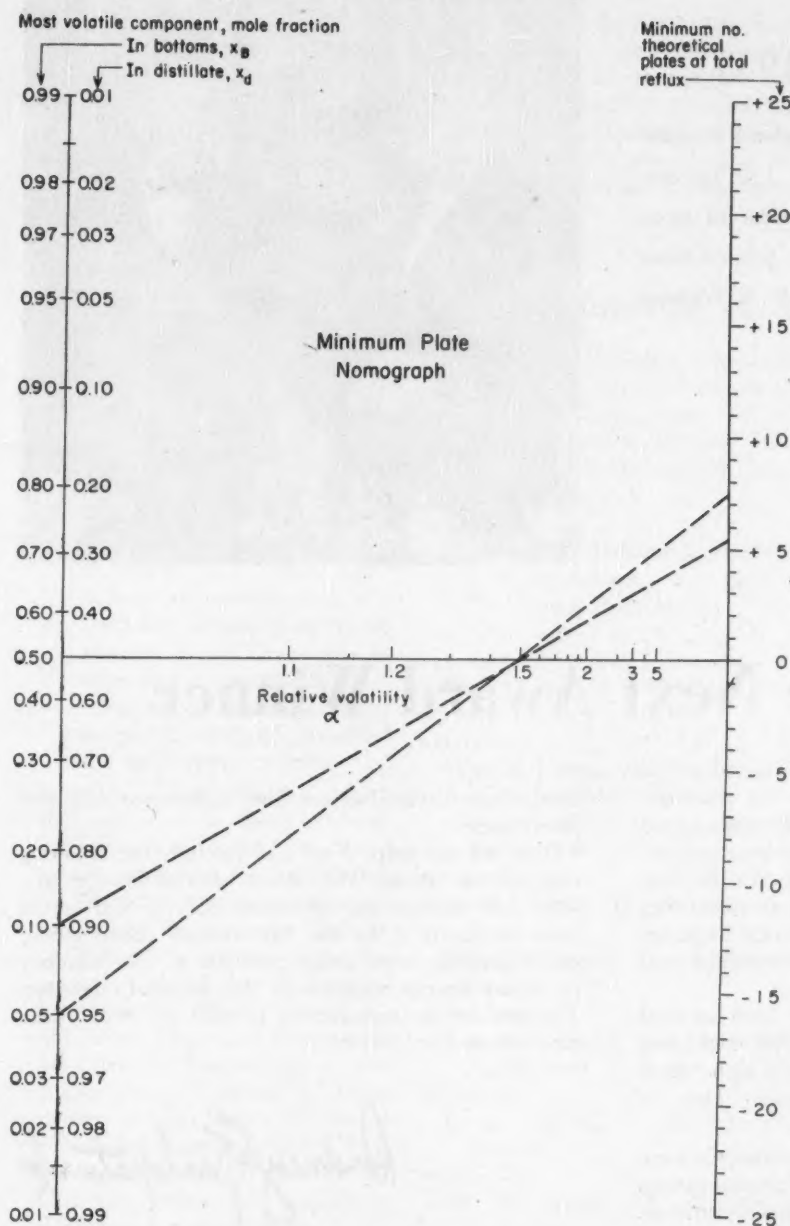
Vapor Pressure vs. Temperature

According to the Clausius-Clapeyron equation, if $\log_{10} P$ is plotted against $1/T$, a straight line results with



slope $-H_v/2.30R$ and intercept C . As a nomograph, this appears as a point between two parallel scales. One scale is a logarithmic one of vapor pressure increasing from bottom to

FERDINAND RODRIGUEZ, at the time this article was written, was a development engineer with the Ferro Chemical Corp., Bedford, Ohio. He is now on active duty in the U. S. Army.



Here the same procedure is followed. In the event that Trouton's rule is used, the intersection of a single vapor-pressure-temperature line with the line for Trouton's constant will define the relationship. The value used for the constant is usually estimated from data on similar chemical compounds. For instance, *n*-butanol, 2-ethylbutanol have a Trouton constant of 30.

Fenske Equation

At total reflux, N , the minimum number of theoretical plates is a function of α ; x_d , the mol fraction of the most volatile component in the distillate; and x_B , the mol fraction of the most volatile component in the bottoms product.¹

$$N = \frac{\log(x_d/1-x_d)(1-x_B/x_B)}{\log \alpha}$$

$$N = \frac{\log(x_d/1-x_d)}{\log \alpha} - \frac{\log(x_B/1-x_B)}{\log \alpha} = f(x_d, \alpha) - f(x_B, \alpha)$$

A nomograph has been set up for each part of this equation—this is the minimum plate nomograph.

This form is believed to be more compact than several previous ones.^{4,5} The extra step of addition is more convenient than the divisions involved in another nomograph developed by A. J. Underwood.⁶

How to Use the Nomograph

- If $x_d = 0.95$, $x_B = 0.10$ and $\alpha = 1.5$, what is N ?

Using x_d and α , $N_d = +7.3$
Using x_B and α , $N_B = +5.4$

$$N = 12.7 \text{ total}$$

- If $x_d = 0.95$, $x_B = 0.55$, and $\alpha = 1.5$, what is N ?

$$N_d = +7.3$$

$$N_B = -0.5$$

$$N = 6.8 \text{ total}$$

top. The other is an arithmetic scale of the reciprocal of the absolute temperature increasing from bottom to top. Each absolute temperature can be expressed, of course, in the Centigrade or Fahrenheit scales.

How to Use the Nomograph

- Normal butanol has the following properties:

Boiling point at 760 mm. Hg³ ... 117.7°C
Vapor pressure at 20°C³ 5.5 mm. Hg

On the nomograph, connect 760 mm. Hg on the B scale with 118° C. on the A scale, and 5.5 mm. Hg with 20° C. The intersection of these two lines is the point through which all vapor pressure-temperature lines will fall according to the Clausius-Clapeyron equation.

- Let's take another example, 2-ethylbutanol-1:

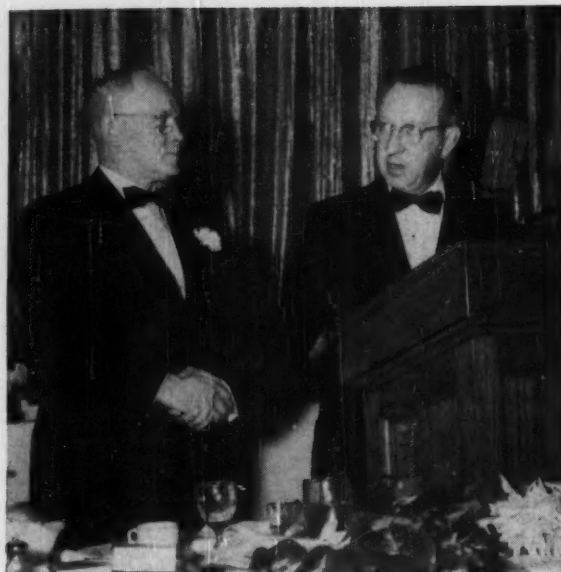
Boiling point at 760 mm. Hg³ 148.9°C
Vapor pressure at 20°C³ 0.9 mm. Hg

REFERENCES

1. Robinson, C. S., and Gilliland, E. R., "Elements of Fractional Distillation," McGraw-Hill Book Co., Inc., New York, 4th Ed. (1950).
2. Prutton, C. F., and Maron, S. H., "Fundamental Principles of Physical Chemistry," The MacMillan Co., New York, (1944).
3. "Synthetic Organic Chemicals," Carbide and Carbon Chemicals Co., New York, 13th Ed. (1952).
4. Smoker, E. H., *Ind. Eng. Chem.* 34, 503 (1942).
5. Davis, D. S., "Chemical Engineering Nomographs," McGraw-Hill Book Co., Inc., New York (1944).
6. Underwood, A. J. V., *Trans. Inst. Chem. Eng.* 10, p. 112 (1932).

In 1953 . . .

Carbide's President
J. G. Davidson
accepted the Award
from Chairman
W. G. Whitman



In 1955 . . .

Help Pick the Next Award Winner

Eighty-three eminent educators, under the chairmanship of Prof. Walter G. Whitman, M.I.T., have agreed to evaluate the outstanding chemical engineering achievements of the past three years. Their ultimate decision will name the company in the chemical process industries that will receive the 1955 Award for Chemical Engineering Achievement. You can help them—and perhaps your company's candidacy.

Preliminary nominations have already been received for a score of recent industrial advances that might well qualify for this coveted honor. They run the alphabetical gamut from acetylene chemicals to zirconium. Here are some typical suggestions:

- From synthetic drug and pharmaceutical producers: new antibiotics, cortisone, synthetic blood plasma, gamma globulin, polio vaccine, hormones such as hydro-cortisone.
- From chemical companies, acetylene derivatives, epoxy resins, fluorocarbons, hydrazine, isocyanates, irradiated polyethylene, nitroparaffins, polyester rubbers, oxygenated hydrocarbons, silicones.
- From petroleum processors: catalytic production and selective absorption of aromatic chemicals, fluid coking, catalytic reforming.
- From fertilizer plants: continuous nitrophosphate and other new processes for concentrated plant foods such as urea and ammonia.
- From chemical-metallurgical operations: titanium, zirconium and hafnium, electrolytic manganese and molybdenum, chemical reduction of copper and cobalt.
- From textile and food industries: new synthetic

fibers, cyanoethylated cotton fiber, dehydrated milk and other foods.

► **How you can help.** First read carefully the following rules and regulations. Then if you know of any company with achievements and personnel policies that would seem to qualify it for the Committee's consideration, please pass the word along promptly to the Secretary or to the nearest member of the Award Committee. The deadline for nominations is April 15, 1955. Let's have lots of them this year.

Rules and Regulations

Purpose—The Award for Chemical Engineering Achievement is made to recognize the results of group effort—of teamwork among executive, engineering, research, production and sales divisions of a corporate organization. It is presented to a company or a department within a company rather than to any individual. Thus it serves the dual purpose of (1) recognizing an outstanding group accomplishment and (2) at the same time calling attention to a company in the process industries that has encouraged its chemical engineers to

participate broadly in all of the affairs of the industry and profession.

Eligibility—The 1955 Award for Chemical Engineering Achievement will apply only to industrial developments that have come into commercial fruition or have become known publicly since January 1952. All nominations must be received by the Secretary of the Committee of Award not later than April 15, 1955. They should contain the following information:

- What is the nature of the company's achievement?
- During what period has it come into commercial fruition?
- To what extent have chemical engineers participated in its development?
- Where are supplementary records, data, articles or references available to the Committee in order that it may give fair consideration to this achievement and to the company's personnel and employment policies?

Judges—The Committee of Award shall consist of the heads of chemical engineering in all of the educational institutions of the United States whose courses are now accredited by the American Institute of Chemical Engineers and the Engineers' Council for Professional Development. Prof. Walter G. Whitman, Chairman, Department of Chemical Engineering at the Massachusetts Institute of Technology, who has been a member of the Award Committee since 1943, has again agreed to serve as our chairman. Sidney D. Kirkpatrick continues as secretary of the Award Committee but without vote.

The Award—The Award shall consist of an appropriate bronze plaque, suitably embossed to indicate the nature of the achievement and the name of the company to be honored. The Award will be presented at a dinner of the chemical engineering profession to be held in connection with the 25th Exposition of the Chemical Industries in Philadelphia on Wednesday, December 7, 1955.

Your Participation—Nominations for this Award are not restricted to those companies that file formal ap-

plications with the Committee. Suggestions are desired *immediately* from any and all sources that will help the Committee by directing attention to companies and industrial groups that should have its careful consideration. Your com-

munications may be addressed in confidence to

Sidney D. Kirkpatrick, Secretary
Committee of Award
Room 2400
330 West 42nd Street
New York 36, New York

1955 Committee of Award

Walter Gordon Whitman, Chairman
Massachusetts Institute of Technology, Cambridge, Mass.

Sidney D. Kirkpatrick, Secretary
McGraw-Hill Publishing Co., Inc.,
New York 36, N. Y.

ALABAMA

C. A. Basore, Alabama Polytechnic Institute, Auburn

K. W. Coons, U. of Alabama, University

ARKANSAS

M. E. Barker, U. of Arkansas, Fayetteville

CALIFORNIA

Wm. N. Lacey, California Institute of Technology, Pasadena

Charles R. Wilke, U. of California, Berkeley

COLORADO

B. E. Lauer, U. of Colorado, Boulder

John M. Lenoir, U. of Denver, Denver

CONNECTICUT

Barnett F. Dodge, Yale University, New Haven

DELAWARE

R. L. Pigford, U. of Delaware, Newark

FLORIDA

W. H. Beisler, U. of Florida, Gainesville

GEORGIA

Paul Weber, Georgia Institute of Technology, Atlanta

IDAHO

M. L. Jackson, U. of Idaho, Moscow

ILLINOIS

H. F. Johnstone, U. of Illinois, Urbana

R. E. Peck, Illinois Institute of Technology, Chicago

L. F. Stutzman, Northwestern University, Evanston

INDIANA

S. G. Bankoff, Rose Polytechnic Institute, Terre Haute

E. W. Comings, Purdue University, Lafayette

R. E. Rich, U. of Notre Dame, Notre Dame

IOWA

G. L. Bridger, Iowa State College, Ames

Karl Kammermeyer, State University of Iowa, Iowa City

KANSAS

J. O. Maloney, U. of Kansas, Lawrence

Henry T. Ward, Kansas State College, Manhattan

KENTUCKY

G. C. Williams, U. of Louisville, Louisville

LOUISIANA

R. V. Bailey, Tulane University, New Orleans

Paul M. Horton, Louisiana State University, Baton Rouge

MAINE

L. C. Jenness, U. of Maine, Orono

MARYLAND

W. J. Huff, U. of Maryland, College Park

MASSACHUSETTS

Chester P. Baker, Northeastern University, Boston

L. B. Smith, Tufts College, Medford

Ernest D. Wilson, Worcester Polytechnic Institute, Worcester

MICHIGAN

D. L. Katz, University of Michigan, Ann Arbor

Henry L. Coles, Mich. College of Mining and Technology, Houghton

H. G. Donnelly, Wayne University, Detroit

C. G. Duncombe, University of Detroit, Detroit

C. F. Gurnham, Michigan State College, East Lansing

MINNESOTA

N. R. Amundson, U. of Minnesota, Minneapolis

MISSOURI

F. D. Oldham, U. of Missouri, Columbia
W. T. Schrenk, Missouri School of Mines, Rolla
L. E. Stout, Washington University, St. Louis

MONTANA

Lloyd Berg, Montana State College, Bozeman

NEW JERSEY

Charles L. Mantell, Newark College of Engineering, Newark
R. H. Wilhelm, Princeton University, Princeton

NEW YORK

L. S. Coonley, Rensselaer Polytechnic Institute, Troy
T. B. Drew, Columbia University, New York
Duane L. Green, Clarkson College of Technology, Potsdam
John Happel, New York University, New York
Jouq-Jen Su, U. of Rochester, Rochester
J. A. Luker, Syracuse University, Syracuse
Donald F. Othmer, Polytechnic Institute of Brooklyn, Brooklyn
A. H. Radasch, The Cooper Union, New York
Fred H. Rhodes, Cornell University, Ithaca
Richard F. Shaffer, Pratt Institute, Brooklyn
G. Edwin White, The City College of New York, New York

NORTH CAROLINA

E. M. Schoenborn, North Carolina State College, Raleigh

NORTH DAKOTA

A. M. Cooley, U. of North Dakota, Grand Forks

OHIO

Joseph H. Koffolt, Ohio State University, Columbus
William Licht, U. of Cincinnati, Cincinnati
A. J. Teller, Fenn College, Cleveland
W. von Fischer, Case Institute of Technology, Cleveland

OKLAHOMA

Robert H. Dodd, Oklahoma A. and M. College, Stillwater
R. L. Huntington, U. of Oklahoma, Norman

OREGON

J. S. Walton, Oregon State College, Corvallis

PENNSYLVANIA

James Coull, U. of Pittsburgh, Pittsburgh
D. S. Cryder, Pennsylvania State University, State College
C. E. Fink, Drexel Institute of Technology, Philadelphia
Alan S. Foust, Lehigh University, Bethlehem
Melvin C. Molstad, U. of Pennsylvania, Philadelphia
C. C. Monrad, Carnegie Institute of Technology, Pittsburgh
Hugh D. Sims, Bucknell University, Lewisburg
Robert E. White, Villanova University, Villanova

TENNESSEE

R. M. Boarts, U. of Tennessee, Knoxville
E. E. Litkenhous, Vanderbilt University, Nashville

TEXAS

W. A. Cunningham, U. of Texas, Austin

A. J. Hartsook, The Rice Institute, Houston

J. D. Lindsay, The Agricultural and Mechanical College of Texas, College Station.

UTAH

E. B. Christiansen, U. of Utah, Salt Lake City

VIRGINIA

F. W. Bull, Virginia Polytechnic Institute, Blacksburg
Robert M. Hubbard, U. of Virginia, Charlottesville

WASHINGTON

R. W. Moulton, U. of Washington, Seattle
Harry Stern, The State College of Washington, Pullman

WEST VIRGINIA

W. A. Koehler, West Virginia University, Morgantown

WISCONSIN

Olaf A. Hougén, U. of Wisconsin, Madison

Recipients of Previous Awards

1933 Carbide & Carbon Chemicals Corporation—the original award was made for producing commercially a large number of synthetic organic chemicals from petroleum and natural gas.

1935 E. I. duPont de Nemours & Co., Organic Chemicals Dept.—for the successful industrial development of neoprene, synthetic camphor and of certain other important organic chemicals and dyestuffs.

1937 Monsanto Chemical Company—for developing the large-scale production and utilization of elemental phosphorus.

1939 Standard Oil Development Company—for new chemical engineering processes and equipment to make available super-fuels for aviation, as well as other valuable products synthesized from the hydrocarbons of petroleum.

1941 The Dow Chemical Company—for the recovery from sea water of magnesium metal sorely needed for aircraft and munitions.

1943 American Synthetic Rubber Industry—67 companies were honored for crowding into 24 months a project that in normal times would have required a dozen years—a mir-

acle of chemical engineering planning and construction.

1946 The Atomic Bomb Project, including 122 companies, universities and research organizations—for contributing as prime contractors so significantly to the research and engineering that were responsible for this war-ending achievement.

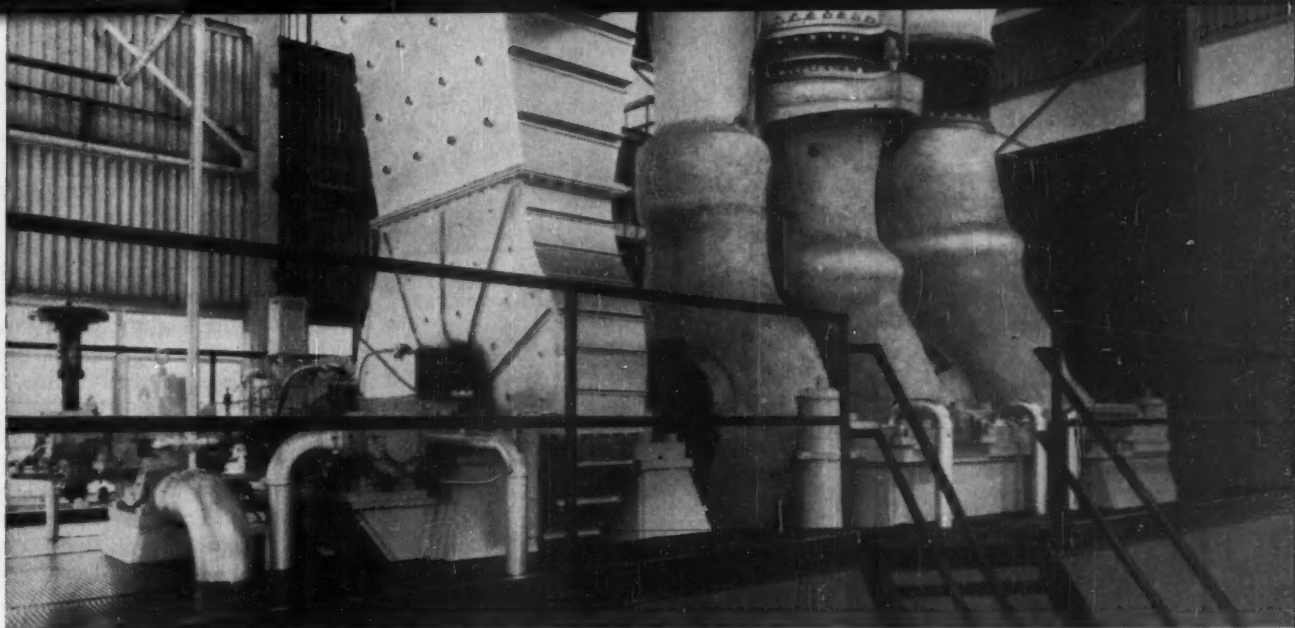
1947 Merck & Co.—for successful pioneering in the large-scale production of streptomycin and other vital medicinals, and, in a broader sense, for service to humanity.

1948 Shell Development Company—for the successful synthesis of glycerine from petroleum for the first time on a commercial scale.

1949 Celanese Corporation of America—for the chemical engineering integration of its textile, plastics and chemical operations.

1951 Phillips Petroleum Company—for pioneering development of high-abrasion carbon blacks and major contributions to the success of cold rubber.

1953 Carbide and Carbon Chemicals Company—for the first commercial production of aromatic chemicals directly from coal by high-pressure catalytic hydrogenation.



4,500-hp. Clark Bros. gas turbine for natural gas compressor station at Morehead, Ky.; combustor is above.

Gas Turbines for Process Use—II

Partial integration of gas turbines into processes seems the most likely approach; tonnage oxygen, synthetic ammonia and nitric acid are most promising process applications.

BENJAMIN MILLER

In Part I of this article (Jan. 1954, pp. 175-180) we saw how combustion gas turbine processes can provide various proportions of power, compressed air, and steam. We saw also how the cycle can be improved by recovering exhaust heat in steam for diluting the combustion gases, and how other waste heat, as well as low-grade fuels, can be used effectively in the process. This second part of the article deals chiefly with a variety of process industry applications where the gas turbine may fit in to advantage.

Supplying Compressed Air

It now appears that the process industries will be most likely to find use for the gas turbine where rather large quantities of air are required at pressures of at least several atmospheres. If power or steam or both are also needed, the gas turbine's chance of

being chosen will be better, but the decisive factor will in most instances be the air requirement.

There are three ways in which the gas turbine can be used to supply compressed air:

1. The gas turbine can supply power to an air compressor in the same way as does a steam turbine or an electric motor. This way is the most generally applicable, but least likely to be used, because in most cases the steam turbine or electric motor will be able to supply the power more economically.

2. The gas turbine process may be completely integrated into some other process which involves combustion under pressure, so that all of the air compressed by the gas turbine's compressor is supplied to the other process and combustion products from the other process alone pass through the expander which drives the air compressor. Obviously the gas turbine can be used in this way only in a few situations, such as the Velox boiler process and the Houdry fixed bed oil cracking process; but if it can be so used, it will probably be more eco-

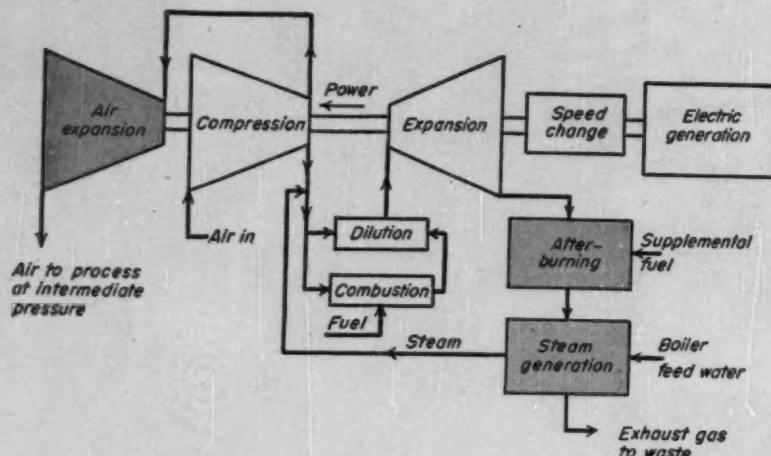
nomical to use the gas turbine than any alternate.

3. The gas turbine process may be partially integrated into some other process which requires air, so that part of the air discharged by the gas turbine's compressor is extracted and used for the other process, while the remainder goes to the gas turbine combustion and mixing steps. This way of using the gas turbine to supply compressed air appears most likely to find use in the process industries.

Pressure Considerations

The thermal efficiency of a gas turbine process and the cost of the equipment for carrying it out are both functions of the compressor pressure ratio. Where the gas turbine is used only to supply power the compressor pressure ratio may be chosen to get the optimum balance between equipment cost and thermal efficiency, and this remains true if the power is used to drive an air compressor. But where air is supplied to another process by the gas turbine's air compressor, the gas turbine's compressor discharge pressure and the pressure at which the

BENJAMIN MILLER, consulting chemical engineer of Ozone Park, N. Y., has made a thorough study of process applications for gas turbines. His article gives conclusions of this study.



GAS TURBINE supplies air at intermediate pressure, plus power—(Fig. 1)

air is needed for the other process must be considered together.

If there is complete integration of the gas turbine process into the other process, the compressor discharge pressure is the pressure at which the air is supplied to the other process, and it must meet the requirements of both processes. Thus the minimum pressure of operation required for effective regeneration in the Houdry fixed-bed process was found to be about 45 psia., but to get more efficient gas turbine operation it was desirable to operate with 68 psia. compressor discharge.

If the pressure at which the air is required by the other process is greatly different from a compressor discharge pressure suitable for the gas turbine process, complete integration is not possible, although partial integration may be. In such a case the air extracted from the gas turbine compressor discharge must be passed through a booster compressor or through an expander. Where the fraction of air extracted is small, and the pressure at which it is required is not much less than the compressor discharge pressure, a pressure-reducing valve will be used, but a turbo-expander will be preferred where the loss by throttling would be excessive.

Cracking Catalyst Regeneration

The moving-bed oil cracking processes which have superseded the Houdry fixed-bed process also require large quantities of air for catalyst regeneration, but the pressures used are much

lower. In one group of processes the catalyst is formed into pellets or beads, and the pressure of the air used to move the catalyst through the system and to burn off the heavy hydrocarbon deposit for regeneration is not more than 4 psig. so that gas turbines are not applicable. In the other group of processes the catalyst is in the form of fine powder, and the air pressure used is in the 10 to 25 psig. range, which is high enough so that gas turbines may sometimes be considered.

A medium-size catalytic cracking unit designed to charge 15,000 bbl. per day and to burn 10,000 lb. of coke per hr. might require 120,000 lb. of air per hr. for regeneration. If the air leaves the blower at 1 atm. gage, the blower will take 2,000 hp. The wet gas compressor, the charge pump, and other components of the unit also take power, so that the total load on the refinery powerhouse may be increased some 5,000 hp. when such a unit is added. If the power house is already operating near its capacity, it may be more economical to install a gas turbine than to increase the capacity of the power house.

Fig. 1 shows a gas turbine process flow diagram for such an installation. The gas turbine chosen would depend upon the total power load to be supplied. If the gas turbine installation were arranged to feed power into the refinery distribution system, a larger gas turbine would be justified than if only the direct load of the catalytic cracking unit were taken.

To replace the 120,000 lb. of air per

hr. needed for regeneration requires 75,000 lb. of dilution steam per hr., on a mole for mole basis (c.f., Part I of this article). The amount of heat in the gas turbine exhaust would generally be insufficient to generate so much steam, so that supplemental fuel would be burned in the exhaust as shown in the diagram. Alternatively, a waste heat boiler fitted with supplemental fuel burners might be used.

The catalytic cracking unit produces much more fuel gas than would be required to take care of its own power load, including the compressed air. If additional power is to be exported, part or all of the supplemental fuel may be residual oil.

The process of Fig. 1 is not applicable to every situation where air at intermediate pressure and power is required, but it may be found to fit under some conditions.

Tonnage Oxygen and Nitrogen

Large scale production of oxygen, nitrogen, or both offers a most attractive field for the use of the gas turbine process to supply the compressed air, particularly where the subsequent use of the product also requires power or process steam or both. As the power required to compress the air to be separated accounts for a major part of the cost of the product, many variations of the basic air separation process have been devised in the attempt to minimize power requirements. While processes have been compared on the basis of horsepower-hours per ton of 95% oxygen produced, such a comparison can be quite misleading in cases where 95% oxygen at atmospheric pressure is not the sole product desired.

Merely to show the magnitude of the power required, it may be stated that air separation takes at least 300 hp.-hr. per ton of oxygen produced, under the most favorable conditions. Under ordinary conditions the power requirement will be 400 to 500 hp.-hr. per ton if the oxygen can be taken from the column as gas, while it will be about 800 hp.-hr. per ton if the oxygen is taken from the column as liquid and vaporized under pressure. Thus a plant to produce 5 tons or more per hr. of oxygen must generate or purchase a sizable block of power.

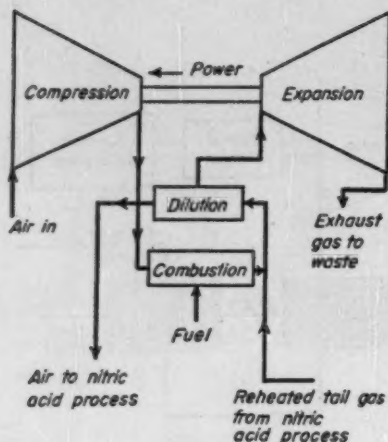
The power requirement for com-

The quantity of compressed air which may be supplied economically by the process of Fig. 2 is related to the power required, but there is no simple way to express the relationship. However, commercially available gas



By suitable combinations of waste heat and fuel burning and by expansion of steam through a steam turbine it becomes possible to modify the process of Fig. 2 to get compressed air, power and steam from a plant which is based upon one or more commercially available combustion gas turbines. It is necessary to analyze the requirements and to consider what equipment commercially available may be used to meet them. The gas turbine process will not fit in every case, but where tonnage oxygen or tonnage nitrogen or both are needed, and power or power and process steam are needed also, the gas turbine process may be the most economical way to do the job.

The amount of air used in the secondary reforming step is just enough to introduce one mole of nitrogen for each three moles of hydrogen produced in the series of reactions, so that after the carbon dioxide and any remaining carbon monoxide have been removed there remains an ammonia synthesis gas having the desired composition. If all the synthesis gas were converted to ammonia it would take 2,180 lb. of air per ton of ammonia;



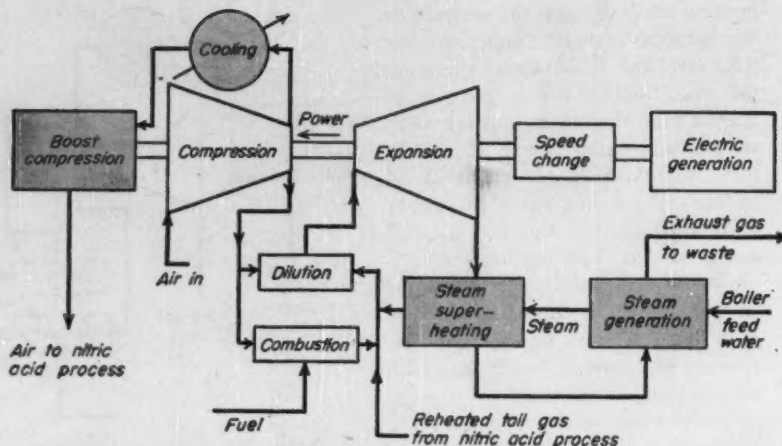
GAS TURBINE process supplies compressed air for ammonia oxidation—(Fig. 3)

however, argon and methane accumulate in the ammonia synthesis zone, and when these are purged some nitrogen and hydrogen are lost also, so that the air requirement is somewhat greater.

Reactions of hydrocarbons with steam and with oxygen to form carbon monoxide and hydrogen result in substantial increase in volume, so that operation of the reforming and shift steps under substantial pressure can decrease to an appreciable extent the power required to compress the synthesis gas. Some recently built plants carry out the reforming operations at elevated pressure, 100 psig. or more, and thus require air compressed to the reforming pressure.

In other recently built plants the natural gas is reacted with 95% oxygen to form a mixture of carbon monoxide, hydrogen, carbon dioxide and steam. This mixture is then treated with additional steam to convert the carbon monoxide to carbon dioxide and to form more hydrogen. After removal of the carbon dioxide there remains a hydrogen-nitrogen mixture to which nitrogen is added to give the mixture the desired analysis. The oxygen-natural gas reaction is carried out under a pressure of 350 psig., so as to minimize the power required for subsequent compression.

With perfect yields the air requirement for the oxygen-natural gas method would be less than 4,100 lb. per ton of ammonia. The actual requirement is about 7,400 lb. of air per ton of ammonia.



POWER-GENERATING gas turbine is shown here integrated into ammonia oxidation process to supply needed compressed air—(Fig. 4)

It has been proposed to prepare ammonia synthesis gas from natural gas by partial oxidation with air, in which case the resulting hydrogen-nitrogen mixture will contain too much nitrogen, and the excess will then be removed by liquefaction. It has also been proposed to use partial oxidation with oxygen-enriched air, the extent of the enrichment being such that the resulting hydrogen-nitrogen mixture will have the desired three-to-one ratio. It seems likely that the compressed air requirement for either of these partial oxidation methods will be close to that for the oxygen-partial oxidation method.

Manufacture of ammonia from byproduct hydrogen is becoming increasingly important. It generally involves air separation to supply the nitrogen which is combined with the hydrogen, as well as nitrogen used in purifying the hydrogen. Where the hydrogen comes from electrolytic cells, little is needed for purification, but a substantial quantity of nitrogen is needed to prepare hydrogen of satisfactory purity from oil refinery gas or coke oven gas.

The treatment of oil refinery gas in the United States is similar to the treatment of coke oven gas abroad in that the bulk of the other components is separated from the hydrogen by fractional condensation, and the resulting impure hydrogen is then scrubbed with liquid nitrogen to produce an overhead stream consisting of hydrogen and nitrogen and a bottoms stream of nitrogen containing the impurities. The quantity of com-

pressed air needed to make synthetic ammonia from byproduct hydrogen thus will vary from case to case, depending upon the kind and quantity of other components in the mixture and the method of separating them. Whether or not a gas turbine process to provide the compressed air and the power will be economical depends upon so many factors that a detailed analysis must be made for each case.

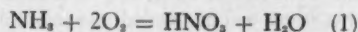
Ammonia to Nitric Acid

The oxidation of ammonia to produce nitric acid is commonly carried out in the United States with air under a pressure of about 100 psig. As it takes about 5 tons of air to make a ton of nitric acid, air compression equipment accounts for a substantial part of the investment cost of a nitric acid plant. The fuel or electrical energy purchased to compress air is responsible for much of the plant's operating expense.

Under suitable conditions both investment and operating expense to supply compressed air for ammonia oxidation can be reduced by using a combustion gas turbine process. If the nitric acid plant is part of an integrated operation which consumes much power, the gas turbine process can be arranged to supply both power and compressed air with even greater advantages. Ammonia synthesis, followed by conversion of part of the ammonia to nitric acid, can make excellent use of the gas turbine in this way.

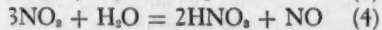
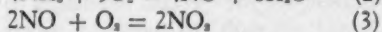
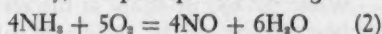
From the over-all reaction for the

oxidation of ammonia to nitric acid



it may be calculated that each ton of ammonia oxidized requires 16.20 tons of air and produces 3.70 tons of nitric acid. In practice it is found necessary to use a small excess of air. There are losses which reduce the yield, so that the actual requirement is closer to 17.35 tons of air per ton of ammonia, and the actual yield about 3.47 tons of nitric acid, whence the figure of 5 tons of air per ton of nitric acid.

Reaction (1) is actually the sum of a large number of reactions which take place consecutively and concurrently, the principal ones being



Reaction (2) is carried out by passing a mixture of air and ammonia through a platinum-alloy catalyst mass which is generally maintained at a temperature in the range 1,600 F. to 1,750 F. The yield and production rate increase with temperature, but so does the loss of catalyst, so that the operating temperature chosen is an economic compromise.

Reactions (3) and (4) take place at relatively low temperature, so that the hot gases leaving the catalyst mass are cooled, eventually to atmospheric temperature, and passed to an absorption system. A small amount of water added at the top reduces the oxides of nitrogen in the tail gases to 0.1 to 0.2% and controls the strength of the nitric acid produced. At the same time, part of the compressed air is introduced at the bottom and strips oxides of nitrogen from the product.

The reaction which takes place in the catalyst generates so much heat that there is a temperature rise across the converter of about 1,170 Fahrenheit degrees with a feed of 1 mole ammonia to 9 moles air.

Power Recovery by Expander

The principal reason for carrying out the process under high pressure is to facilitate absorption, so the tail gas leaves the absorption system under pressure of 80 psig. or higher. As the oxygen consumed is 20% or less of the air introduced, the tail gas is equivalent to 80% or more of the air, and expansion of the tail gas to

atmospheric pressure in suitable equipment can generate an appreciable amount of power.

It has therefore become standard practice to recover a substantial fraction of the power used to compress the air by expanding the tail gas, which is reheated before expansion by heat exchange with the gases leaving the catalytic converter. The heat exchange performs a major part of the cooling of the converter effluent, which must be cooled anyway, while at the same time it increases the amount of power available from the expansion.

The temperature to which the tail gas may be reheated has until recently been limited by the expansion equipment. With reciprocating expanders the maximum temperature is about 550 F., because lubrication is not practical at any higher temperature. Turbo-expanders now in use are suitable for inlet temperatures up to 850 F., except those most recently installed which can be operated at 900 F. to 925 F.

One manufacturer now offers turbo-expanders for inlet temperatures up to 1,200 F. Although there is enough heat in the gases leaving the converter to raise the temperature of the tail gases to 1,200 F., the cost of the heat exchange equipment needed appears prohibitive. Somewhat higher temperatures may be considered in a few cases, but it now appears that the

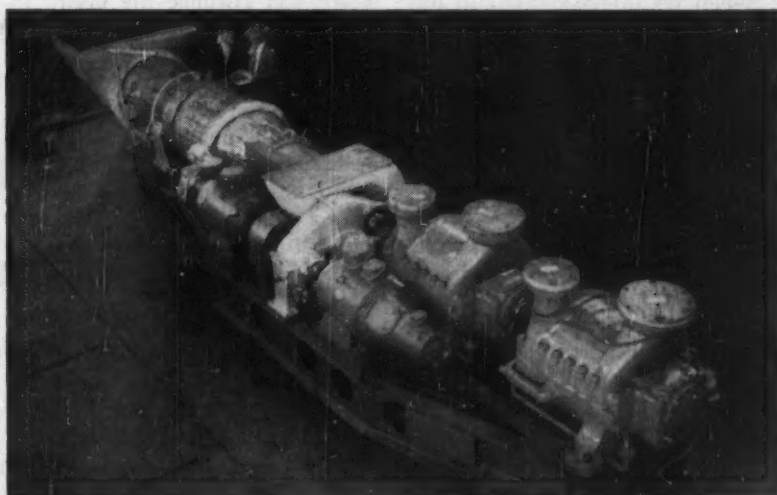
temperature to which the tail gas can be reheated is limited by heat exchanger cost considerations to 900 F.

In the conventional process a unit now being used consists of a centrifugal compressor, a turbo-expander, and a second driver. This last is either an electric motor or a steam turbine. With a very efficient centrifugal compressor, and a very efficient turbo-expander operating on tail gas reheated to 900 F., it is possible to reduce the net power supplied by the second driver to about one-third of the gross power taken by the compressor. However, recovery of less than half the gross power is likely under less favorable conditions.

Gas Turbines for Nitric Acid

Integration of the combustion gas turbine process into the nitric acid production process can be accomplished in several ways, but the most generally applicable include three features:

1. The compressed air used for ammonia oxidation is taken from the compressor of a combustion gas turbine.
2. The tail gas from the nitric acid absorption is used as a diluent in the combustion gas turbine process, thereby replacing an equimolar quantity of compressed air.
3. The specific volume of the tail gas is increased before it is used to dilute combustion products, by heat



1,800-hp. mobile gas-turbine-driven air compressor built by Westinghouse; trailer to house unit appears in background.

taken from the gases leaving the catalytic converter.

These three features are combined in a simple process for which Fig. 3 is the flow diagram.

Comparison of Fig. 3 with Fig. 1 in Part I of this article shows that the two processes are quite similar in many respects. They differ in that, in Fig. 3, there is no net power absorption, while there is supply of compressed air to the nitric acid process and utilization of reheated tail gas from the nitric acid process.

The quantity of air used for combustion and dilution is quite small compared to the quantity of air supplied to the nitric acid plant, so that the equipment required for the process of Fig. 3 is not much larger than the compressor and expander of the conventional unit. The second driver is eliminated, although a starting means must be provided. The fuel cost is much less than the cost of the steam or electrical energy used in the conventional process.

The exhaust gas can be used to generate steam which can serve as additional diluent, and the fuel requirement can then be reduced, but the size of the expander will be greater and the steam-generating equipment will have to be provided.

Combining Power and Air Supply

When the nitric acid plant is part of an installation which requires power, the gas turbine process is modified to generate the power as well as to supply the compressed air. In this way the most effective use can be made of the heat recovered from the ammonia oxidation reaction. Here the gas turbine's compressor does double duty, so that investment and operating costs are both reduced.

The amount of power which can be generated as a byproduct of the compressed air supply is limited by the maximum allowable turbine inlet temperature. If there is need for more power, the excess can be produced economically by increasing the ratio of combustion and dilution air to process air.

When the amount of air used for combustion and dilution is large, it is economical to compress all of the air only to the tail gas pressure, and then to boost the pressure of that portion

of the air which goes to the nitric acid plant.

A gas turbine process to supply compressed air for oxidation of ammonia to produce nitric acid and also to supply electric power is shown in flow diagram form as Fig. 4. The turbine exhaust gas is passed through a waste heat boiler to produce superheated steam which is used to dilute the combustion products, together with dilution air and the reheated tail gas from the nitric acid process.

Commercial Considerations

Our discussion thus far has been concerned chiefly with the gas turbine process, and very little with the gas turbine as a machine. The viewpoint has been that of the process engineer considering the integration of a gas turbine process into a larger process. But the utility of any process depends upon the availability of equipment with which to carry it out, and at the present time the availability of equipment to carry out gas turbine processes is quite limited.

The combustion gas turbine is an assembly which includes an air compressor, a combustion and dilution system, and a combustion products expander, just as a steam turbine power plant is an assembly which includes a feed pump, a boiler, and a steam turbine. But there is a difference. The prospective user of a steam turbine power plant can establish the steam conditions, select components to produce the required amount of power, and assemble the plant. Instead, the prospective user of a gas turbine power plant is offered only a complete assembly, in one of a few standard sizes. This situation may change as the number of gas turbines made increases, but at the present time it costs so much to get ready to make a gas turbine of a particular design that if only one were to be made, the price would almost surely be prohibitive.

It follows that the engineer considering the integration of a gas turbine process into a larger process cannot assume that technical feasibility of a design is enough to assure that a gas turbine plant meeting his requirements can be procured. If the application requires a large number of identical units, then a quotation may

be obtained. But, if only one or two machines will be needed, the manufacturers will probably not be willing to quote.

So long as this situation exists it will be necessary to work backward, and to adapt the process to the equipment which is commercially available. As each manufacturer makes only one or a few standard machines, it may require considerable ingenuity to modify the process so that a standard machine can be used, and in many cases no suitable machine will be available. Sometimes a manufacturer will be willing and able to modify a standard machine to make it fit process needs.

While the special utility of the gas turbine in the process industries is bound up with its ability to supply compressed air or steam or both in addition to power, the gas turbine manufacturer customarily considers it only as a supplier of power. Gas turbines are therefore rated and warranted only as to capability and thermal efficiency. The manufacturer will state that under stipulated conditions the machine will generate at least a specified number of horsepower or kilowatts and that it will consume not more than a specified number of Btu. per hr. when operating at a specified load. Maximum allowable speed and maximum allowable turbine inlet temperature will be given, and sometimes maximum allowable turbine exhaust temperature. Air flow rate, pressure and temperature at compressor discharge, pressure and temperature at turbine inlet, and turbine exhaust temperature may be measured when the machine is running, but manufacturers do not usually make such test results public. Information about such operating conditions may be needed when the machine is to exhaust to a boiler, or when air is to be extracted from the compressor discharge, and the manufacturer will supply information as part of sales negotiation, but with such safeguards as may be considered commercially necessary.

As in the case of Part I of this article, some of the processes mentioned are covered by patents and patent applications owned by The Chemical Foundation, Inc. Release of the information for publication is acknowledged with the author's thanks.

These determine handling costs:

Number of direct labor operators

Number of indirect labor operators

Number of material handlers

Cost of material handling equipment

Cost of operating handling equipment

Cost of maintaining handling equipment

Cost of floor space

Volume of output

Getting at Your Handling Costs

... Are they going up or down?

... Just what do they consist of?

Do you know the answers to these two questions? Remember—handling costs are tremendous and you can't pick them off of your cost sheet.

GEORGE A. SMITH

THERE certainly appears to be no master formula for material handling costs. Each plant must set up its own system of cost analysis and then follow a standard pattern in all studies. A standard pattern will indicate a trend if the study involves a determination of whether costs are going up or down.

From the basic data in the table on this page, ratios can be formulated which will usually indicate trends. In most cases, these figures are computed on a plant-wide basis, although they can be broken down by department or division.

When we analyze material handling costs we must include not only processing, but the functions of receiving, stores, final stores, and shipping as well.

If we wish to make a comparison of cost trends plant-wide, it is well to consider the following factors:

First, determine the total number of direct labor operators, then the total number of indirect labor operators. Compute a ratio between the two groups and use it for further comparisons.

Next step is to segregate all of the labor grades that are considered as doing material handling. These should include such groups as material handlers, power truck operators, receiving, packing and shipping, stock room personnel, elevator operators, and mail clerks. Some plants may have other classifications or different headings, but this nomenclature will cover most of the personnel included in the category of material-handling.

Now the next two ratios to develop will be those of material handling to direct labor and material handling to total indirect labor. The three resultant ratios will indicate the trend in material handling cost. Should a radical change be noted for any one month, then a further breakdown by departments will reveal the origin or cause of the change.

To continue the trend study, the next logical step is to compare a standard unit of shipment or production

GEORGE A. SMITH is materials handling engineer, I.B.M. Corp., Endicott, N. Y., and president of the American Materials Handling Society.

with the number of material handling personnel. The dollar is not a good unit since adjustments must be made to compensate for price changes. A unit in production might be a slight improvement over dollars, but that will depend entirely on what factors are used in determining the unit. Tons of end product shipped is probably the best common denominator, but

again if the weight consistencies of product are at a wide variance, some adjustments should be made to this figure.

However, since cost analysis of this nature is relative and the figures plugged into the formulae for each period are based on the same fundamentals, the results will indicate fairly accurate trends.

Determining Actual Handling Costs

There are three main factors that enter into material handling costs that we will consider next in developing our analysis technique. They are (1) labor, (2) equipment, parts, and supplies, and (3) floor space.

► **Labor**—When a material handling problem is presented for study, we endeavor to make savings in two labor classes—direct and indirect.

When a saving is made of "x" number of direct or indirect labor hours, it is customary to add to the actual hourly rate the cost of the fringe benefits.

The method of distributing burden is still a matter of controversy. Although it is recognized that burden charges should be spread over direct or prime cost, we cannot reconcile its use in connection with either direct or indirect labor costs, when computing material handling savings.

As each problem is studied, the cost department should be checked for labor rates since they will vary from period to period based on variable charges.

► **Equipment**—Our next consideration is that of equipment, parts and supplies. When comparing two methods or procedures, whether they be present and future or two future plans, we must consider the following:

1. Original cost.
2. Salvage value.
3. Years of life (write off).
4. Interest rate on investment.
5. Cost of maintenance.

This formula is a variation of the straight line method and is generally used because of its simplicity:

$$\frac{[(\text{Original cost} - \text{salvage value})/\text{years write-off}] + \text{annual cost of maintenance}}{\text{total annual cost}}$$

Cost of maintenance of material handling equipment is receiving greater attention as material handling engineers are becoming more analytical in their thinking. Let's consider this facet of the cost analysis using the industrial power truck as the piece of equipment being studied—although the methods and end results can apply to any type of material handling equipment.

The industrial power truck is subject to hard usage and the whims of the operators, and unplanned down time on material handling equipment can spell ominous delays to production schedules. It is of extreme importance to collect performance records in such a manner that their collection cost will be nil, and the results tabulated on a current basis so that information is not obsolete by the time it is available.

Pertinent information relative to maintenance or repairs performed is mark-sensed onto a tabulating card upon which the identifying information has been pre-punched and interpreted. At the end of each week or month, the tabulating cards are processed through an electronic accounting machine and an accumulative report is printed. This will show types of repairs by truck manufacturer, truck type, department, class of work performed. It will also list trucks in chronological order to show age, and show many other breakdowns.

The report can then be subjected to a very critical cost analysis which will divulge the following pertinent information:

1. Which type of truck is costing the most to operate.
2. Cost comparison of repairs and

maintenance between two or more manufacturers.

3. Excessive cost of repairs might indicate truck is not of sufficient capacity for the job, or it is being over-worked.

4. Operator is not exercising good care in running the truck.

5. Age coupled with maintenance cost would indicate replacement of equipment.

6. Extensive repair could indicate bad floors, roadways, or ramp conditions.

All of these conditions will indicate what steps should be taken to correct the existing conditions and can be a guide in purchasing future handling equipment.

► **Floor Space**—When a problem is studied, the cost of floor space must be analyzed since effective use of such space is of prime importance in today's industrial picture.

Factors affecting this cost computed on a per month basis will include maintenance of buildings, building depreciation rate, taxes, plant protection, insurance, heat, light, and air conditioning, as well as other building services.

In making a cost analysis, responsibility should be in the hands of the material handling engineer since he has a comprehensive knowledge of equipment, procedures, and plant layout. Data used, however, should be supplied by other departments whose job it is to keep certain records. If this data must be collected in the material handling department, then it should be discussed with the cost department so that there is a complete meeting of the minds.

There are two important points about which there should be no question, but which at times do not receive the proper attention:

1. In making a cost analysis, you should double-check all of your figures and make sure of the source. Nothing can spoil a cost analysis more than an error.

2. After a cost analysis has been made, it is customary to put it into report form. Again check your statements for ambiguity, double meaning, or no meaning at all. A poorly written report will leave the reader cold, whereas a well written report will make a lasting impression.

Chemical Engineering Fundamentals

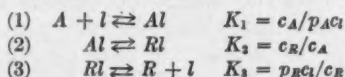
Catalytic Vapor Phase Reactions—II

THOMAS E. CORRIGAN, Research Engineer, Olin Mathieson Chemical Corp., Brandenburg, Ky.

Last month (*Chem. Eng.*, Jan. 1955, p. 199) we derived some of the adsorption equations that are important in catalytic kinetics. We'll derive a few more this month and then discuss the generalizations that may be made from the equations and the assumptions upon which they are based.

Derivation of Some Additional Equations

For the reaction of A going reversibly to R, the proposed mechanism is:



If step 1, the adsorption reaction, controls:

$$\begin{aligned} r &= k_1 p_A c_l - k_1' c_A \\ r &= k_1 p_A c_l - (k_1' p_R c_l / K_2 K_3) \\ r &= k_1 c_l [p_A - (p_R / K_1 K_2 K_3)] \\ &= k_1 c_l [p_A - (p_R / K)] \end{aligned}$$

We can simplify this rate equation if we solve for the value of c_l and substitute,

$$\begin{aligned} L &= c_A + c_R + c_l = p_R c_l / K_2 K_3 + (p_R c_l / K_3) + c_l \\ c_l &= L / [1 + (p_R / K_2 K_3) + (p_R / K_3)] \\ r &= k_1 L [p_A - (p_R / K)] / [1 - (p_R / K_2 K_3) - (p_R / K_3)] \\ r &= k [p_A - (p_R / K)] / [1 + (K_R p_R)] \end{aligned} \quad (1)$$

where $k = k_1 L$ and $K_R = (1/K_2 K_3) + 1/K_3$.

Nomenclature (Consistent units)

A, B	Reactants
c	Concentration of adsorbed gas
k	Rate constant, forward reaction
k'	Rate constant, reverse reaction
K	Equilibrium constant
K'	A constant related to K
l	An active center
L	Total effective concentration of active centers
p	Equilibrium partial pressure of adsorbent gas
r	Reaction rate
R, S	Products
X	A free radical
Additional subscripts	
i	Of inert gases

We can also derive the rate equation for the case where the surface reaction, step 2, is controlling.

$$r = k_2 c_A - k_2' c_R$$

where $c_A = K_1 p_A c_l$ and $c_R = p_R c_l / K_3$. Then,

$$\begin{aligned} r &= k_2 K_1 p_A c_l - (k_2' p_R c_l / K_3) \\ r &= k_2 K_1 c_l [p_A - (p_R / K_1 K_3 K_2)] \end{aligned}$$

As before we'll solve for the value of c_l and substitute.

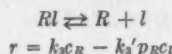
$$\begin{aligned} L &= c_l + c_A + c_R = c_l + K_1 p_A c_l + (p_R c_l / K_3) \\ c_l &= L / [1 + K_1 p_A + (p_R / K_3)] \\ r &= k_2 K_1 L [p_A - (p_R / K)] / [1 + K_1 p_A + (p_R / K_3)] \end{aligned}$$

or

$$r = k [p_A - (p_R / K)] / (1 + K_A p_A + K_R p_R) \quad (2)$$

where $k = k_2 K_1 L$; $K_R = 1/K_3$; and $K_A = K_1$.

If the desorption reaction, step 3, is controlling the derivation of the rate equation would be:



where $c_A = K_1 p_A c_l$; and $c_R = K_2 c_A = K_1 K_2 p_A c_l$.

$$\begin{aligned} r &= k_3 K_1 K_2 p_A c_l - k_3' p_R c_l \\ r &= k_3 c_l K_1 K_2 [p_A - (p_R / K_1 K_2 K_3)] \\ r &= k_3 c_l K_1 K_2 [p_A - (p_R / K)] \end{aligned}$$

Once again we solve for c_l , substitute and arrive at the rate equation:

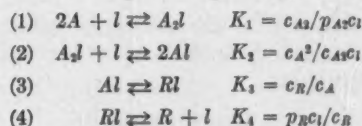
$$r = k_3 L [p_A - (p_R / K)] / (1 + K_1 p_A + K_1 K_2 p_A)$$

or,

$$r = k [p_A - (p_R / K)] / (1 + K_A p_A) \quad (3)$$

where $k = k_3 L$; and $K_A = K_1 + K_1 K_2$.

Even for the simple reaction, of the type A going reversibly to R, there are more possibilities. The three steps shown above are only the simplest possible case. The same reaction might take place by this mechanism:



The derivation of this case with adsorption, step 1, controlling would be:

$$r = k_1 p_A^2 c_l - k_1' c_{A_2}$$

CE REFRESHER . . .

From step 2, $c_{A2} = c_A^2/K_2c_1$; $c_A = c_A/K_1 = p_A c_1/K_1 K_1$. Then,

$$c_{A2} = p_A^2 c_1^2 / K_2 K_1^2 2K_4 2c_1 = p_A^2 c_1 / K_2 K_1^2 2K_4^2$$

$$r = k_1 c_1 [p_A^2 - (p_R^2 / K_1 K_2 K_1^2 K_4^2)]$$

but $K_1 K_2 K_4^2 K_1^2 = K$ (since multiplying step 3 and step 4 by two and then adding the steps gives the over-all reaction).

Again we must eliminate c_1 , giving

$$r = k[p_A^2 - (p_R^2/K)] / (1 + K_R p_R + K_R' p_R^2) \quad (4)$$

where $k = k_1 L$; $K_R = (1/K_1 K_4) + (1/K_1)$; and $K_R' = K/K_1 = 1/K_2 K_4^2 K_1^2$.

In this case the term p_A^2 appears in the driving force term. This might be classified as a "second order, single site" catalytic reaction. The exponent 2 on the p_A and p_R terms in the driving force is coincident with the 2A which appears in the controlling step.

Since only one active center is involved in the controlling step, the sum of the adsorption terms in the denominator is still taken to the first power.

If step 2 were controlling, it would be a "second order, dual site" mechanism. The corresponding rate equation would be

$$r = k[p_A^2 - (p_R^2/K)] / [1 + K_R p_R + K_A p_A^2] \quad (5)$$

Notice that p_A^2 and p_R^2 still appear in the driving force term and, in addition, the sum of the adsorption terms is taken to the second power. This is coincident with the appearance of two active centers in the controlling step.

If the surface reaction, step 3, were controlling the equation would be:

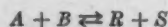
$$r = k[p_A - (p_R/K)] / (1 + K_A p_A + K_A' p_A + K_R p_R) \quad (6)$$

Likewise, if the desorption reaction, step 4, were controlling the equation would be:

$$r = k[p_A - (p_R/K)] / (1 + K_A p_A + K_A' p_A) \quad (7)$$

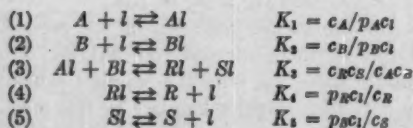
Other Common Rate Equations

Similar equations can be derived for almost all reactions and for almost every conceivable mechanism by which the reaction could proceed. One more very common case, that of the reaction



will be shown.

The simplest possible series of steps for this reaction would be:



Suppose that step 1, the adsorption reaction of A, were the controlling reaction. The rate equation for this case would be:

$$r = \frac{k[p_A - (p_R p_S / p_B K)]}{1 + K_R p_R p_S + K_B p_B + K_R p_R + K_S p_S} \quad (8)$$

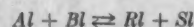
Here, where two reactants are involved (A and B in this particular case) and where the adsorption of

one (A in this case) is controlling, the partial pressure of the other appears in the denominator of the second term of the driving force. (Note the term $K_{RIS} p_R p_S$).

If the adsorption reaction of B were controlling, the rate equation would be:

$$r = \frac{k[p_B - (p_R p_S / K p_A)]}{1 + K_R p_R p_S + K_A p_A + K_R p_R + K_S p_S} \quad (9)$$

If the surface reaction



were controlling, the equation would be:

$$r = \frac{k[p_A p_B - (p_R p_S / K)]}{(1 + K_A p_A + K_B p_B + K_R p_R + K_S p_S)^2} \quad (10)$$

For the case of one of the desorption reactions controlling, such as step 4 or step 5, the rate equation is:

$$r = \frac{k[(p_A / p_S) - (p_R / K)]}{1 + K_A p_A + K_B p_B + (K_R p_A p_B / p_S)} \quad (11)$$

Notice that here the partial pressure of the product whose desorption reaction does not control appears in the denominator of the second term of the driving force.

Sketches on p. 197 illustrate the mechanisms for the cases of single reactant single site, single reactant dual site, and two reactants dual site.

What Is the Effect of Inert Gases?

In the equations derived we assumed that the reactants and products were the only gases present in the system. If an inert gas were present during the reaction, the term $K_i p_i$ would appear as another addition term in the denominator. If several inert gases were present a separate term could appear for each, or all the inerts could be treated as a single component. Then a single $K_i p_i$ term would suffice for all.

Once the flow process were in operation the catalyst would soon become saturated with respect to inerts and the composition of the inerts would not change during the process. Last month (*Chem. Eng.*, Jan. 1955, p. 201), we presented a table of reaction mechanisms and their corresponding rate equations. The equations shown in this table do not contain the terms for the inerts but they can be modified easily to account for their presence by the addition of the proper term in the denominator (see p. 198).

For example, Eq. (10) corrected for the inerts would be:

$$r = \frac{k[p_A p_B - (p_R p_S / K)]}{(1 + K_A p_A + K_B p_B + K_R p_R + K_S p_S + K_i p_i)^2}$$

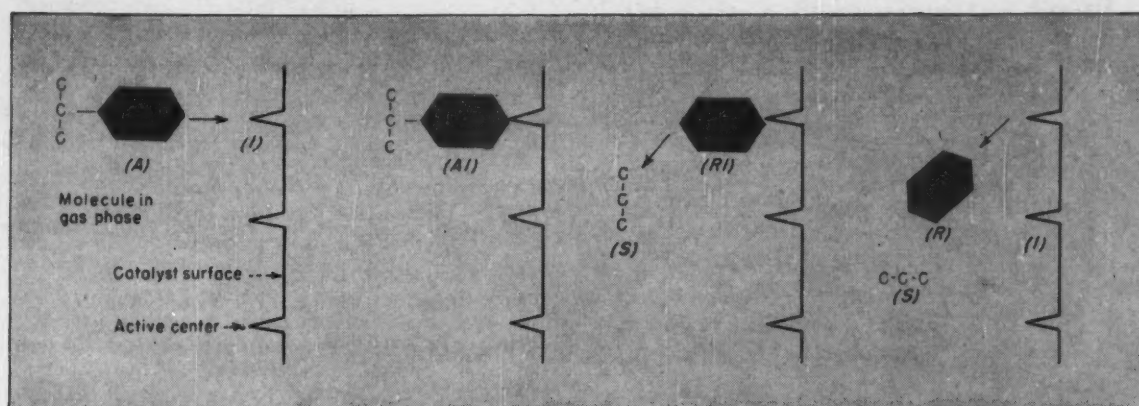
The derivations presented in this and last month's installment show how the rate equation of a catalytic vapor phase reaction depends on the mechanism of the reaction.

Generalizations in the Rate Equations

Observing the rate equation that can be derived to correspond to each postulated mechanism leads to these generalizations:

- The rate equation consists of a numerator which

Single-Site Mechanism



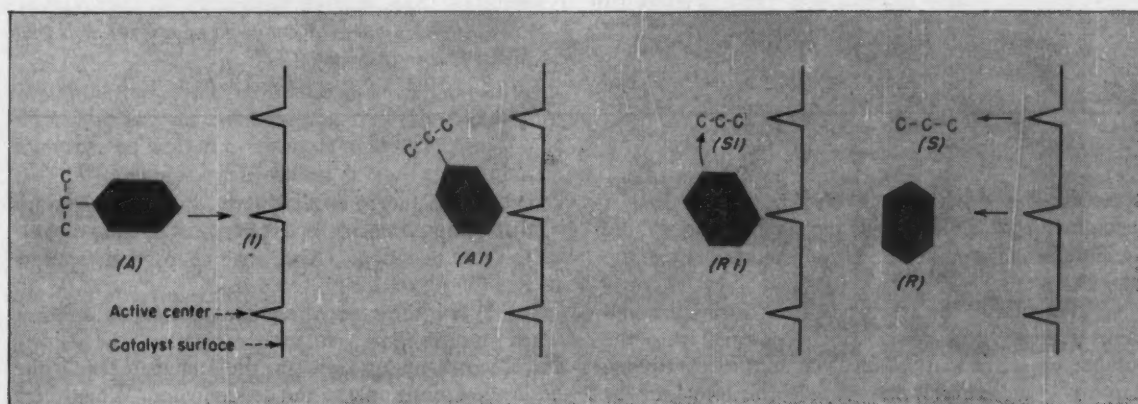
Molecule of reactant approaches surface ...

.. and is adsorbed.
 $A + I \rightleftharpoons AI$

Adsorbed molecule splits.
 $AI \rightleftharpoons RI + S$

Product desorbed.
 $RI \rightleftharpoons R + I$

Dual-Site Mechanism



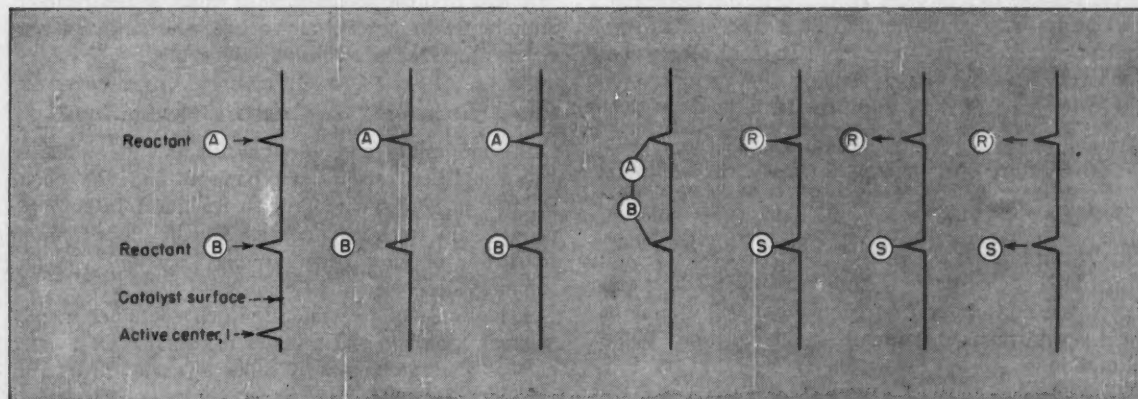
Molecule of A approaches catalyst surface ...

... and is adsorbed.
 $A + I \rightleftharpoons AI$

Part of molecule attaches to second active center.
 $AI + I \rightleftharpoons RI + SI$

Products are desorbed.
 $RI \rightleftharpoons R + I$
 $SI \rightleftharpoons S + I$

Dual-Site With Two Reactants



Reactants approach surface.

$A + I \rightleftharpoons AI$

$B + I \rightleftharpoons BI$

$AI + BI \rightleftharpoons RI + SI$

$RI \rightleftharpoons R + I$

$SI \rightleftharpoons S + I$

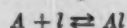
Mechanisms and Their Corresponding Rate Equations

Chemical Equation	Catalytic Steps	Controlling Step	Rate Equation
$A \rightleftharpoons R$	$A + l \rightleftharpoons Al$ $Al \rightleftharpoons Rl$ $Rl \rightleftharpoons R + l$	$A + l \rightleftharpoons Al$ $Al \rightleftharpoons Rl$ $Rl \rightleftharpoons R + l$	$r = k[p_A - (p_R/K)]/(1 + K_R p_R)$ $r = k[p_A - (p_R/K)]/1 + K_A p_A + K_R p_R$ $r = k[p_A - (p_R/K)]/(1 + K_A p_A)$
$A \rightleftharpoons R$	$2A + l \rightleftharpoons A_2l$ $A_2l \rightleftharpoons 2Al$ $Al \rightleftharpoons Rl$ $Rl \rightleftharpoons R + l$	$2A + l \rightleftharpoons A_2l$ $A_2l \rightleftharpoons 2Al$ $Al \rightleftharpoons Rl$ $Rl \rightleftharpoons R + l$	$r = k[p_A^2 - (p_R^2/K^2)]/(1 + K_R p_R + K_R' p_R^2)$ $r = k[p_A^2 - (p_R^2/K^2)]/(1 + K_R p_R + K_A p_A^2)$ $r = k[p_A - (p_R/K)]/(1 + K_A p_A^2 + K_A' p_A + K_R p_R)$ $r = k[p_A - (p_R/K)]/(1 + K_A p_A^2 - K_A' p_A)$
$A \rightleftharpoons R + S$	$A + l \rightleftharpoons Al$ $Al + l \rightleftharpoons Rl + Sl$ $Rl \rightleftharpoons R + l$ $Sl \rightleftharpoons S + l$	$A + l \rightleftharpoons Al$ $Al + l \rightleftharpoons Rl + Sl$ $Rl \rightleftharpoons R + l$	$r = k[p_A - (p_R p_S/K)]/(1 + K_R p_R p_S + K_R p_R + K_S p_S)$ $r = k[p_A - (p_R p_S/K)]/(1 + K_A p_A + K_R p_R + K_S p_S)^2$ $r = k[p_A - (p_R p_S/K)]/p_S[1 + K_A p_A + (K_A p_A/p_S) + K_S p_S]$
$A \rightleftharpoons R + S$	$A + l \rightleftharpoons Al$ $Al \rightleftharpoons Rl + S$ $Rl \rightleftharpoons R + l$	$A + l \rightleftharpoons Al$ $Al \rightleftharpoons Rl + S$ $Rl \rightleftharpoons R + l$	$r = k[p_A - (p_R p_S/K)]/(1 + K_R p_R)$ $r = k[p_A - (p_R p_S/K)]/(1 + K_A p_A + K_R p_R)$ $r = k[p_A - (p_R p_S/K)]/p_S[1 + K_A p_A + (K_R p_A/p_S)]$
$A + B \rightleftharpoons R + S$	$A + l \rightleftharpoons Al$ $B + l \rightleftharpoons Bl$ $Al + Bl \rightleftharpoons Rl + Sl$ $Rl \rightleftharpoons R + l$ $Sl \rightleftharpoons S + l$	$A + l \rightleftharpoons Al$ $B + l \rightleftharpoons Bl$ $Al + Bl \rightleftharpoons Rl + Sl$ $Rl \rightleftharpoons R + l$	$r = k[p_A - (p_R p_S/K p_B)]/(1 + K_R p_R p_S + K_B p_B + K_R p_R + K_S p_S)$ $r = k[p_B - p_R p_S/K p_A]/(1 + K_R p_R p_S + K_A p_A + K_R p_R + K_S p_S)$ $r = k[p_A p_B - (p_R p_S/K)]/(1 + K_A p_A + K_B p_B + K_R p_R + K_S p_S)^2$ $r = k[(p_A p_B/p_S) - (p_R/K)]/[1 + K_A p_A + K_B p_B + K_S p_S + (K_R p_A p_B/p_S)]$

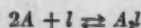
represents the driving force of the reaction and a denominator which contains terms pertaining to the equilibrium adsorption of each component on the catalyst.

- The sum of the adsorption terms in the denominator is raised to a power which corresponds to the number of active centers involved in the controlling step. The mechanism may be identified in part by this number—such as single site, dual site, etc. For example, in Eq. (10) the term $(1 + K_A p_A + K_B p_B + K_S p_S)$ is raised to the second power because it is a dual-site reaction.

- The partial pressure of each component appearing in the driving force term is taken to the same power as the number of molecules appearing in the adsorption reaction for each component. This is true whether the adsorption reaction is or is not the controlling one. For instance, in the over-all reaction of A going reversibly to R plus S, if the adsorption step is

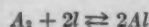


the driving force is $p_A - (p_R p_S/K)$; but if the adsorption is



the driving force is $p_A^2 - (p_R^2 p_S^2/K^2)$.

- When a molecule is dissociated upon adsorption the partial pressure of that component will appear to the $\frac{1}{2}$ power wherever it appears in the equation. If the adsorption is



the driving force is $p_A^{0.5} - (p_R^{0.5} p_S^{0.5}/K)$.

- If the adsorption or desorption of a particular

component is the controlling step, the partial pressure of that component does not appear in the denominator of the rate equation. (Note that no p_s term appears in Eq. (3) above.)

- When the surface reaction steps are in series or when there is only one surface reaction, the driving force term appears only in the numerator and the adsorption terms only in the denominator. When there are two or more surface reactions in parallel, the equation contains a sum of terms in the numerator as well as in the denominator.

These six generalizations are drawn merely from the mathematical derivation of the equations. An accumulation of experimental data on rates of catalytic reactions may lead to other generalizations which would be more important with respect to the actual behavior of reacting systems than these.

Chain Reactions vs. Catalytic Mechanisms

It is interesting to point out at this time the similarity between these catalytic mechanisms and the chain reaction theory for homogeneous reactions. In homogeneous chain reactions there are usually chain-forming steps, one or more chain-carrying steps and a chain-stopping step.

A molecule or free radical which combines with a reactant molecule and is then regenerated in a later part of the mechanism is called a chain carrier. In catalytic reactions, the active center l behaves as a chain carrier. We find that the active center combines with the reactant molecule in the adsorption

steps and is regenerated as an active center in the desorption step.

Since the chain carrier is really introduced artificially as part of the catalyst, there is no need for a chain-initiating step. There is usually no chain-breaking step. In the cases where there is a chain-breaking step we say that the catalyst has been "poisoned." The table to the right illustrates this comparison.

Assumptions Needed for the Derivations

In the development of rate equations we have made some assumptions. They are:

1. The resistance to the physical steps is so slight that only a chemical step can control the reaction.

2. Furthermore, the resistance to diffusion is so slight that the partial pressure at the interface is practically the same as that in the bulk of the gas stream.

3. Only one of the steps of the reaction is rate-controlling and there is no shift of the controlling step during the reaction.

4. The adsorption steps are all chemisorption and the adsorption reactions behave as those discussed in the sections on adsorption (*Chem. Eng. Nov. 1954, p. 236 and Dec. 1954, p. 198*).

5. The specific rate constants and the equilibrium adsorption constants are independent of total pressure.

6. The rate equation for the single rate-controlling step may be written as a simple order reaction.

7. The empty active centers, l , and the adsorption compounds, Al , Rl , etc., react according to the law of mass action. That is, for the reaction



the rate equation would be: $r = k p_A c_l$.

This is the same as stating that the law of mass action would apply to the reactions within two dimensional systems as well as to three dimensional systems (as in a homogeneous gas-phase reaction, for instance).

Are the Assumptions Logical?

Let's discuss the logic of each assumption individually. Assumptions 1 and 2 do not mean that one of the physical steps can not control the reaction. They mean only that these equations apply to the case where one of the chemical steps is rate-controlling. In the case where there is a significant film resistance it can be accounted for by using the terms p_{Ai} , p_{Bi} , p_{Si} and p_{Si} , representing partial pressures at the interface. The partial pressure gradients over the film may be estimated by methods that we'll show later.

Assumption 3 may not hold in all cases. Where there is a shift of controlling step with conversion or where each step of the series contributes almost equally to the resistance, the rate equations will not be so simple as those derived.

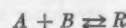
The importance of assumption 4 is fairly obvious. The pertinent steps of adsorption and desorption were written as adsorption and desorption reactions and the equilibrium equations of these reactions were necessary for the derivation.

Comparing a Homogeneous Free Radical Reaction With Reaction on Catalyst

Homogeneous Reaction	Catalytic Reaction
1. Chain-forming $A \rightleftharpoons X_1 + R$	1. Adsorption $A + l \rightleftharpoons Al$
2. Chain-propagating $A \rightleftharpoons X_1 + X_2$	2. Surface reaction $Al + l \rightleftharpoons Rl + Sl$
3. Chain-stopping $X_1 + X_2 \rightleftharpoons S$	3. Desorption $Rl \rightleftharpoons R + l$ $Sl \rightleftharpoons S + l$
4. Over-all reaction $A \rightleftharpoons R + S$	4. Over-all reaction $A \rightleftharpoons R + S$

Assumption 5, that the rate and equilibrium constants are independent of total pressure, is another point that is open to discussion. In homogeneous reactions it is generally conceded that the constants are independent of total pressure—as long as the deviations from the ideal gas law are not great. However, the reaction upon the surface of the catalyst involves a three-dimensional gas phase and a two-dimensional surface phase.

Consider, for example, a comparison between the homogeneous step



and the catalytic step



The simple order rate equation for each would be:

$$\text{Homogeneous } r = k p_A p_B \quad (12)$$

$$\text{Catalytic } r = k p_A c_l \quad (13)$$

In both cases the constant k is assumed to be independent of pressure. Yet in Eq. (12) both p_A and p_B are pressure dependent while in Eq. (13) only p_A is pressure dependent. Further fundamental research will establish this point.

Assumptions 6 and 7 point out that even the basic rate equation for the controlling step is based upon the assumption that the individual step follows a simple order reaction. To assume a controlling step such as



and to say that the fundamental rate equation of this step is

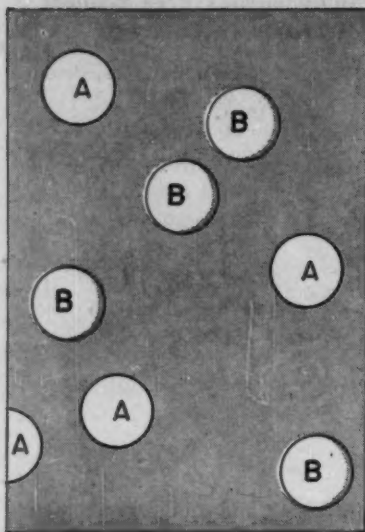
$$r = k c_{Al} - k' c_{Rl} c_{Sl}$$

is an application of the law of mass action to non-homogeneous systems.

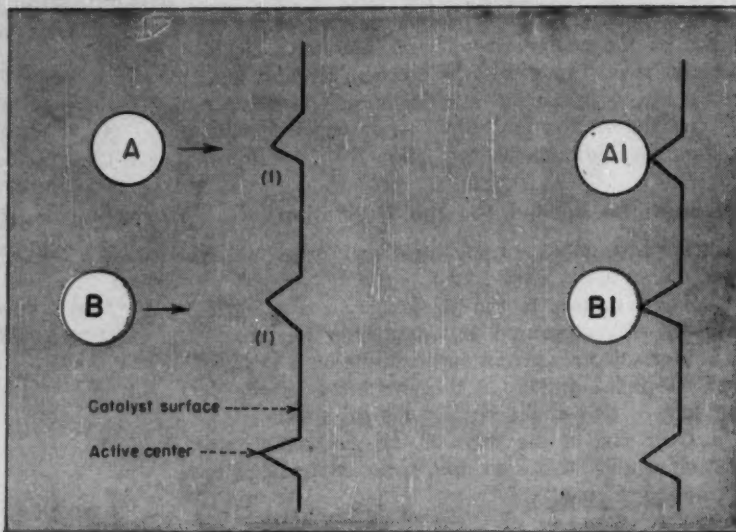
This means that a reaction between an adsorbed molecule and an empty active center—both of which are immobile on a two-dimensional surface—would have to follow the same laws that apply to the reaction between two molecules, both of which are free to move in three-dimensional space. This is the basic assumption behind these equations.

The validity of this assumption can be tested only by further research into the fundamental laws of catalytic

Homogeneous vs. Heterogeneous Reactions: Law of Mass Action Basis



In gas phase (homogeneous) molecules may move in any direction.
 $A + B \rightleftharpoons R + S$



Molecules of A free to move in any direction but I's are fixed.
 $A + I \rightleftharpoons AI$

Both A1 and B1 are confined to a two-dimensional surface.
 $A1 + B1 \rightleftharpoons R1 + S1$

kinetics. As more fundamental research is done these assumptions may or may not stand the test of time (see illustrations above).

In many discussions involving active centers it has been argued that the catalyst surface contains centers of varying activity. Some centers may have greater activity for one reaction or step than for another. It seems logical that the activity of the active centers varies throughout the catalyst.

If we regard I as a symbol which represents a hypothetical center whose activity is equal to the average activity of all the active centers which affect this reaction, this does not change the equation. As a matter of fact, it may be observed that in deriving the rate equations there have been no limitations added regarding the physical nature of the active center, except that it is present.

Before the development of these equations it was customary to correlate catalytic reaction data on the basis of equations that are valid for homogeneous reactions only—or empirical terms were added to account for adsorption of individual components on the catalyst surface. The equations presented here represent a systematic method which not only takes adsorption into account but also has some bearing on the mechanism of the reaction.

A point that might be questioned is whether it would be possible by proper adjustment of the empirical constants to superimpose the curves of the two equations (each for a different mechanism). If this can be done the equations would not be capable of showing a distinction between mechanisms.

Consider, for instance, the equations:

$$r = k[p_A - (p_R p_S / K)] / (1 + K_A p_A + K_R p_R + K_S p_S)$$

and,

$$r = \frac{k[p_A - (p_R p_S / K)]}{p_S [1 + K_A p_A + (K_R p_R / p_S) + K_S p_S]}$$

Would it be possible for each to contain constants such that the shapes of the integrated curves would be almost indistinguishable from each other?

A valuable calculation would be the estimation of the degree of accuracy needed in the experimental data in order to distinguish between the equations by the shape of their curves. Perhaps it is these questions and others that lead some experimenters to correlate their experimental data with equations which are entirely empirical and have no reference to the mechanisms.

NEXT MONTH

We'll discuss how kinetic data are expressed and how they are obtained.

REPRINTS AVAILABLE

You can now get reprints of the first four sections of the CE Refresher series. Price 50¢ each. Use your Reader Service postcards inside back cover for fastest delivery.

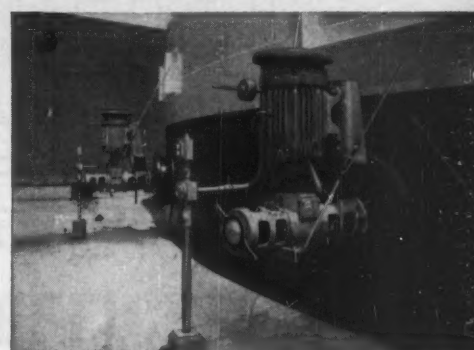
Thermodynamics Reprint No. 42
Compression-Expansion . . . Reprint No. 45
Chemical Equilibrium Reprint No. 49
Homogenous Kinetics Reprint No. 57



BATCHES OF ANY SIZE can be mixed in a few minutes with a top entering LIGHTNIN Mixer. Any size tank, open or closed, can be fitted with a unit like this. Mixing action is provided by radial-flow turbine impellers, accurately sized and powered to give correct fluid regime for the process. Hundreds of power-speed combinations are available, ranging from 1 to 500 HP input.



MIXING AT AN ANGLE can save cost of baffling the tank. Axial-flow propellers, sized for the job, rapidly turn over and rotate tank contents for thorough mixing. You have a choice of 30 LIGHTNIN Mixers of this type, for open or closed vessels, ranging from 1/4 to 3 HP. Many modifications are possible for special needs.



IN VERY LARGE TANKS, you can mix, blend, circulate, suspend solids, with a LIGHTNIN Side Entering Mixer—faster and more cheaply than by any other method. You save on shaft seal maintenance, too, thanks to new easy-to-get-at, easy-operating tank shutoff. Sizes from 1 to 25 HP, for tanks as big as 6 million gallons.



DO HUNDREDS of mixing jobs efficiently, at low cost with LIGHTNIN Portable Mixers. Thousands are in use today. Many in service 20 years and longer. Electric or air motors, direct or gear drive. More than 30 standard models. Sizes 1/4 to 3 HP. Full choice of motors, materials.

How to choose a fluid mixer

For best fluid mixing results, choose a mixer that:

1. gives you the right balance between fluid *flow* and fluid *shear* for the process
2. requires the least horsepower to do the job
3. pays off in years of maintenance-free service.

You get *all three* with LIGHTNIN Mixers.

Selection of the right mixing action for your process is based on test data *guaranteed accurate*.

You can be sure all the power you buy goes into the batch.

Efficient use of power is assured by special load-test equipment, plus widest possible choice of standard mixer power-speed-torque combinations.

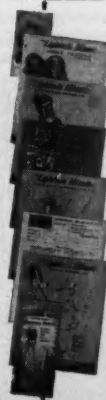
You get engineering refinements such as flex-protected gearing, interchangeable speeds, simple repacking, easy replacement or change of components—all adding many years of useful life to the mixers you choose—when you choose LIGHTNINS.

For quick, competent help on fluid mixing, call in your LIGHTNIN representative. Or write us today.

Lightnin® Mixers

GET THESE HELPFUL FACTS ON MIXING LIGHTNIN Catalogs contain practical data on impeller selection; sizing; best type of vessel; installation and operating hints; full description of LIGHTNIN Mixers. Yours without obligation. Check and mail coupon today.

MIXCO fluid mixing specialists



- ☐ DH-50 Laboratory Mixers
- ☐ DH-51 Explosionproof Laboratory Mixers
- ☐ B-102 Top Entering Mixers (turbine and paddle types)
- ☐ B-103 Top Entering Mixers (propeller type)
- ☐ B-104 Side Entering Mixers
- ☐ B-105 Condensed Catalog (complete line)
- ☐ B-107 Mixing Data Sheet
- ☐ B-108 Portable Mixers (electric and air driven)

MIXING EQUIPMENT Co., Inc.

128-b Mt. Read Blvd., Rochester 11, N. Y.

In Canada: Greey Mixing Equipment, Ltd.
100 Miranda Avenue, Toronto 10, Ont.

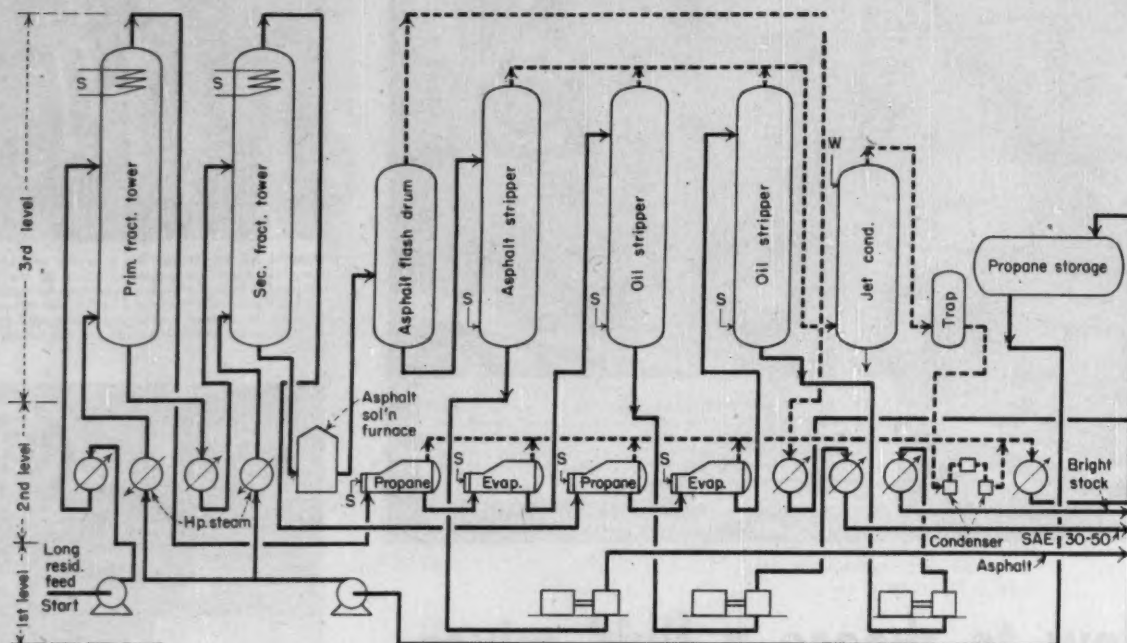
Please send me, without obligation, catalogs checked at left.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____



★ November Contest Prize Winner

How to Make Flowsheets Easier Reading

Ismael Rodriguez L. and Thomas Garcia B.

Respectively, Chief Safety Engineer and Chief Chemist, Petroleos Mexicanos, Poza Rica, Ver., Mexico.

As a rule it becomes more difficult to read a flowsheet as the amount of equipment in it increases. We have developed a standard form which makes it as easy to read a large flowsheet as a small one.

The idea is simply to draw the

equipment on as many levels as there are principal classes of equipment. Above, for example, there are three main classes: (1) fluid flow equipment; (2) heat transfer equipment such as heaters and heat exchangers, coolers and evaporators; and (3) tanks and towers, including

vessels and fractionating columns.

We select one level for each class—pumps and compressors on the first level, heat transfer equipment on the second, and tanks and towers on the third level. For the principle pieces of processing equipment we draw in-flows at the left, out-flows at the right.

The drawing above was prepared by applying this scheme to a Kellogg flowsheet for propane fractionation which appeared on page 227 of *Petroleum Refiner*, Sept. 1954. Comparison will show how the new method improves clarity, ease of reading, and ease of take-off of the various kinds of equipment.

★ December Contest Prize Winner.

"Pivot-Lift Mechanism
Handles Heavy Covers
For Equipment Manholes."

A prize of \$50 in cash will be awarded to Robert J. Ford, Assistant Supervisor, The Chemstrand Corp., Decatur, Ala. Mr. Ford's simple and valuable idea will be described in the March issue.

\$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award \$50

cash each month to the author of the best short article received that month and accepted for publication in the *Plant Notebook*. Each month's winner will be announced the second following month and published the third following month.

\$100 ANNUAL PRIZE—At the end of each year the monthly winners will be judged to determine the year's best *Plant Notebook* article, which will then be awarded an additional \$100 prize.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other

than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible. Acceptable but non-winning articles will be published at regular space rates (\$10 minimum).

Articles may deal with plant or production "kinks," or novel means of presenting useful data, which will interest chemical engineers. Address *Plant Notebook* Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.



How you can get MAXIMUM FILTRATION EFFICIENCY at lower cost

Unless a filter can be depended upon for maximum clarity *at all times* . . . it isn't very efficient.

And if downtime between cycles is out of balance with productive time . . . it's not very economical.

A Niagara Horizontal Filter will filter to clarity at rates up to 45,000 GPH . . . and maintain that degree of clarity hour after hour. Niagara flow rates are 2 to 5 times greater than those of old fashioned cloth covered presses.

Furthermore, a Niagara can be taken off stream, drained, opened, cleaned, closed, filled and precoated by one man *in a matter of*

minutes, not hours. And since no cloths are required for most operations, there's a tremendous saving in material, time and labor.

These are just a few of the reasons why your Niagara Filter will help you improve product quality, cut production time and reduce costs. It's easy to see why Niagara Filters pay for themselves in a remarkably short time.

Talk it over with a Niagara Filtration Engineer. These men are specialists in liquid-solids separation. They'll analyze your filtration problems . . . test your samples . . . pilot the filtration . . . and build a Niagara to meet your most exacting requirements. Mail coupon for details.

Niagara FILTERS
A DIVISION OF
American Machine and Metals, Inc.
DEPT. CE-255, EAST MOLINE, ILLINOIS

YES . . . we'd like to know more about Niagara Pressure Leaf
Filters for _____

☐ Send new catalog NC-1-53

☐ Have representative call

Name and Title _____

Company _____

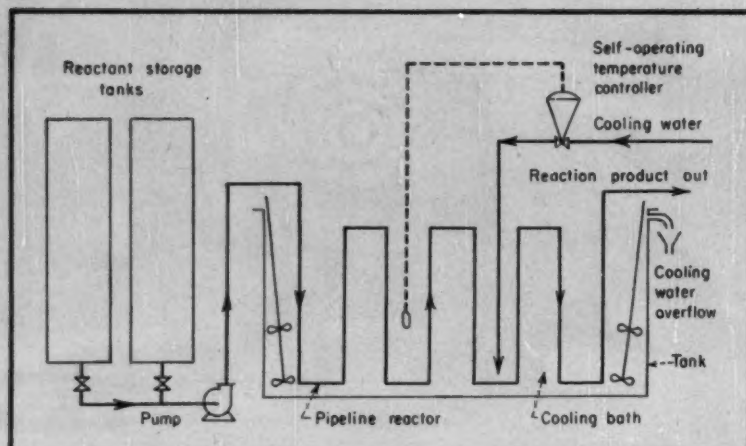
Address _____

City _____

Zone _____

State _____

Specialists in Liquid-Solids Separation



Water Bath Controls Pipeline Reactor

Anthony P. Massa

Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

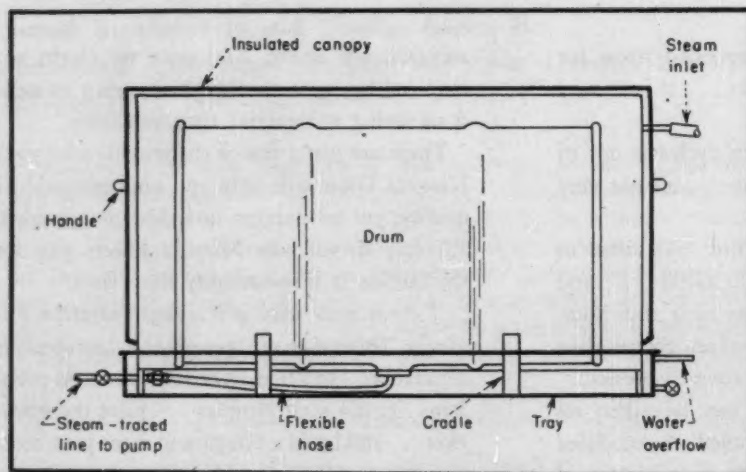
This method is useful in controlling the reaction temperature in extensive or complicated pipeline reactors where exact temperature control is necessary. It saves the cost of many unit temperature con-

trollers which otherwise would have to be installed at various points in the pipeline in order to control the reaction temperature. It can be applied where the reaction is at or above room temperature.

The only equipment necessary for this method of temperature control is a tank to serve as a water bath, and a self-operating temperature controller or temperature control valve. The temperature controller and reactor bath are shown in the sketch.

The pipeline reactor is immersed in a large water bath which provides cooling to control the reaction temperature. If the reaction bath temperature rises, the self-operating temperature controller allows the spring-loaded control valve to open and let more cooling water enter the bath. Agitators keep the whole bath uniformly mixed so that no hot spots can occur along the length of the pipeline reactor. An overflow is provided at the top of the reactor bath tank to drain the excess cooling water.

This method can be used for controlling reaction temperatures in chlorination, esterification and other organic reactions. It provides an accurate and economical method of temperature control for pipeline reactors of all sizes, even those having high throughputs.



Drum Melter Sealed Against Vapor Loss

N. R. Bechwith

Beckers Pty. Ltd., Dudley Park, South Australia

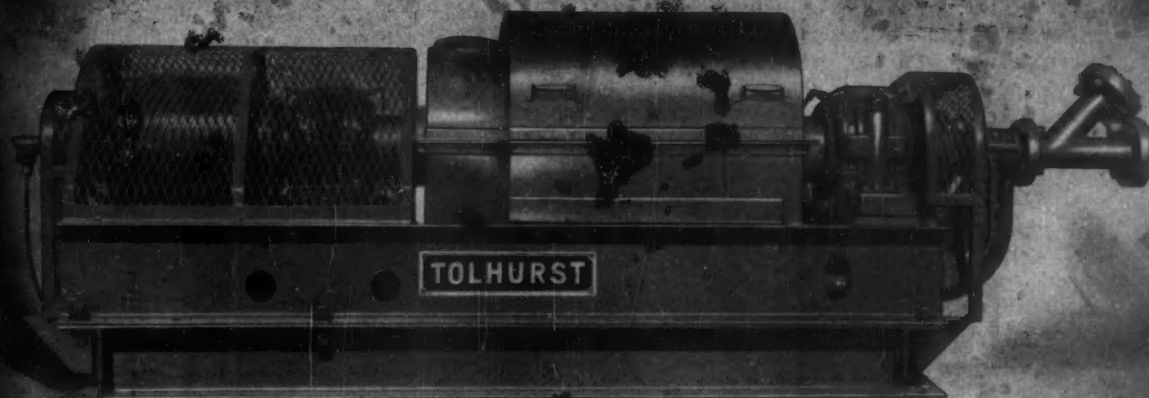
Raw material for one of our manufacturing processes is par-nitrochlor benzene, which comes in steel drums of varying sizes from

44 to 90 gal. These drums are of various dimensions and sizes of bung. The chemical sets up solid in the drum.

Originally we used to cut the drums open and knock out the solid with a sledge hammer—which involved considerable physical effort since the steel of some of the drums was $\frac{1}{2}$ in. thick. The material melts at 82 C. so we decide to try melting out. We built a trial melter at small cost which proved successful.

First, we constructed a mild steel tray with a cradle of curvature suitable for holding drums of any diameter. A light-gage steel canopy, suitably lagged, was made to fit over the largest drum. The canopy rests on four small steel legs and fits loosely in the tray. Low-pressure steam from tracer lines is admitted to the canopy.

To discharge the molten material we made up a set of bung plugs to fit each size of drum. The plug is drilled and a long-radius bend is welded in. A suitable piece of hose or flexible metal tubing is attached and provided with a coupling for the other end. We



THIS NEW CENTRIFUGAL

handles one material continuously
...or several materials intermittently

Here is the most flexible continuous centrifugal ever designed. For example . . . if you run continuously on a single product, your Tolhurst "Maxi-Flex" can be instantly adjusted to take care of process fluctuations or variations in technique. Beach speeds can be changed at a moment's notice from 0 to 300 inches per minute. A simple adjustment gives you any one of seven different pool depths. And the proper settling rate for maximum efficiency is assured by an available force field which can be varied up to almost 2000 times gravity.

Or . . . if you want to make short runs of several different products you can still enjoy

the advantages of continuous centrifuging. Simply adjust beach speed and pool depth to suit each run. And the self-cleaning feed chambers make the change-over from one product to another a quick, simple operation with minimum downtime.

The new Tolhurst "Maxi-Flex" Continuous Centrifugal has been under field and laboratory tests for more than three years. It has fully proved its ability to handle a wide variety of materials with amazing speed, efficiency and economy. Perhaps this is the equipment you need to improve your operation. May we tell you about it?

Tolhurst

CENTRIFUGALS

A DIVISION OF

American Machine and Metals, Inc.

DEPT. CE-255, EAST MOLINE, ILLINOIS

☐ Send illustrated literature describing the new Tolhurst "Maxi-Flex" Continuous Centrifugal

☐ Have representative call

Name and Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Specialists in Liquid-Solids Separation

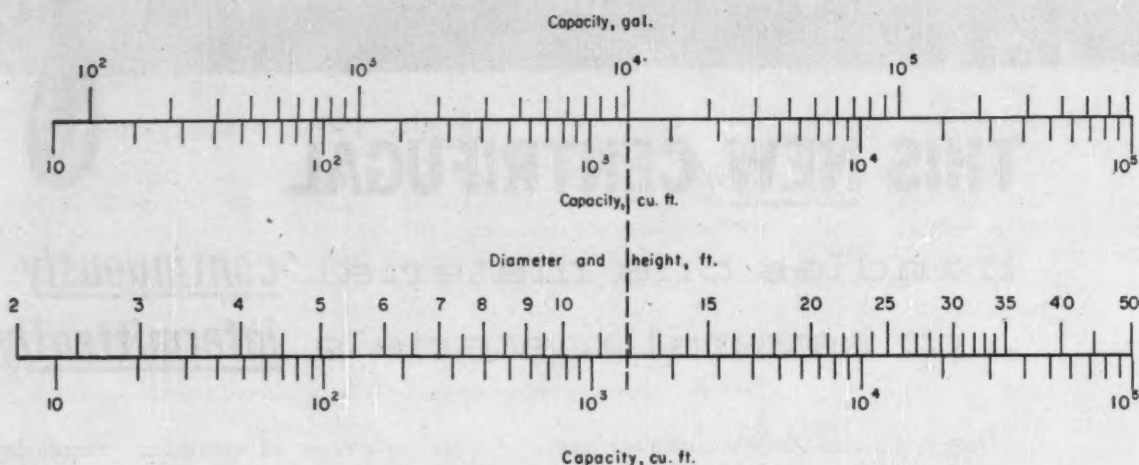
connect the outlet line from the tray to a steam-jacketed pump by a permanent steam-traced line, or by a removable flexible tube inside a larger rubber hose. This is kept hot by steam from the canopy. With the drum and canopy in place the tray is filled with water to act as a seal.

To use this arrangement we first punch a small hole in the drum opposite the bung, or remove an end plug if suitably located, to act as a vent. If a hole is used it can be subsequently welded up so as not to damage the drum. Then we open the bung and screw in the

discharge-line fitting, using a suitable gasket for a good seal. Then the drum is hoisted into place with the discharge at the bottom and the outlet hose connected.

With the canopy over the drum and the tray filled with water we turn on the low-pressure steam for a time determined sufficient by trial. As soon as the drum contents is melted we start the pump and empty the drum. When the canopy has been removed it is a good idea to check with a piece of wire through the vent hole to make sure that the drum has been completely emptied.

This arrangement has several advantages. It can be made portable if desired for transfer by a lift truck. If used this way, it can be moved under an existing chain hoist, then transferred and connected up to the steam-jacketed pump and steam line. The method can be used for any chemical melting below 100 C. Equipment and operating costs are low, labor needs are slight, and the drums can be re-used. The idea is adaptable to drums with bungs in the end, and there is no reason why it can not be wide enough to handle several drums at a time.



Cylindrical Tanks for Minimum Cost

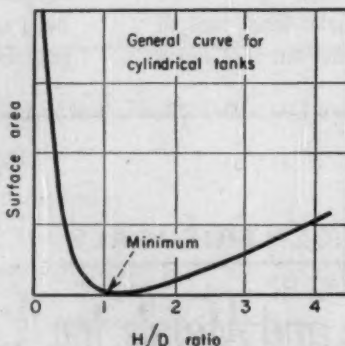
J. R. LaPointe

Atomic Power Div., Westinghouse Electric Corp., Bettis Field, Pa.

For a given volume the cost of a cylindrical storage tank depends upon the physical dimensions of the tank. As the total surface area (for a given thickness) approaches a minimum, then the cost becomes minimum. The greatest volume that can be contained in the minimum surface area is that of a sphere. For a cylindrical tank this requirement is approached as the ratio of height to diameter H/D approaches a value of 1. The chart at the right shows this.

The method given here enables the reader rapidly to determine the optimum-cost dimensions of any cylindrical tank by the use of the

conversion scales above. These scales convert gallons into cubic feet and then solve for the tank dimension which will yield a mini-



mum surface area and hence minimum cost.

Example—A 10,000-gal. tank is to be sized so that its cost will be a minimum ($H = D$). What is the height (and diameter) of this storage tank?

Solution—By use of the conversion scales, a 10,000-gal. tank is equivalent to 1,335 cu. ft.

The diameter and height which gives minimum cost is about 12 ft.

The cost for a tank with these dimensions and a wall thickness of $\frac{1}{4}$ in. is calculated from the surface area, $\pi DH + \pi D^2/2 = 678$ sq. ft.

Now, assuming the density of the metal to be 500 lb./cu. ft., then the weight of metal is $678 \times (0.5/12) \times 500 = 14,100$ lb. If the cost of the metal is 50 c./lb., then the approximate cost of the tank is $14,100 \times 0.50 = \$7,050$.



How to exhaust fumes from boiling brass . . . without hoods

In brass melting furnaces, normal temperatures run from 1850° to 2350° F. Terrific heat and irritating fumes are given off by these open furnaces.

To improve working conditions around their furnaces, Standard Brass Manufacturing Company of Kansas City, Missouri tried several fan and hood systems without success. Then they installed five DeBothezat Bifurcator Fans, one for each two furnaces. Bifurcators with 27" diameter fan wheels and 2 HP motors, operating at 1140 RPM, were selected. The high velocity of these DeBothezat Bifurcator Fans made it possible to use open ducts behind the furnaces in place of hoods above them.

Now working conditions around the furnaces are satisfactory. And furnace charging and unloading is safer, easier and faster *without hoods*.

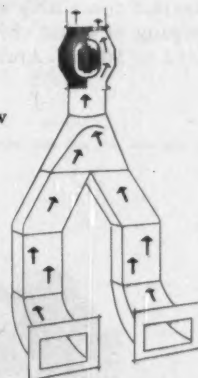
DeBothezat Bifurcator Fans are ideal for installation where space is limited, because they are compact, and

install right in the duct work. Bifurcator Fans can be made of carbon steel, stainless steel, rubber coated steel, monel metal and many other corrosion or heat-resistant materials.

If you have a fume removal problem, DeBothezat Bifurcator Fans may be the answer. Write our factory for illustrated catalog DB-4-53.

HOW BIFURCATOR WORKS

The Bifurcator is a motor driven axial-flow fan in a patented, divided housing. Motor is in an isolated chamber around which flue gases are by-passed (bifurcated) so that the motor always remains cool, clean and accessible. Bifurcators are available in many sizes from 1140 CFM (12" diameter fan with 1/20 HP motor) up to 45,000 CFM (48" diameter fan with 20 HP motor).



De Bothezat FANS

A DIVISION OF

American Machine and Metals, Inc.

DEPT. CE-255, EAST MOLINE, ILLINOIS

- ☐ Send illustrated bulletin on Bifurcator Fans.
- ☐ Have representative call.

NAME AND TITLE

COMPANY

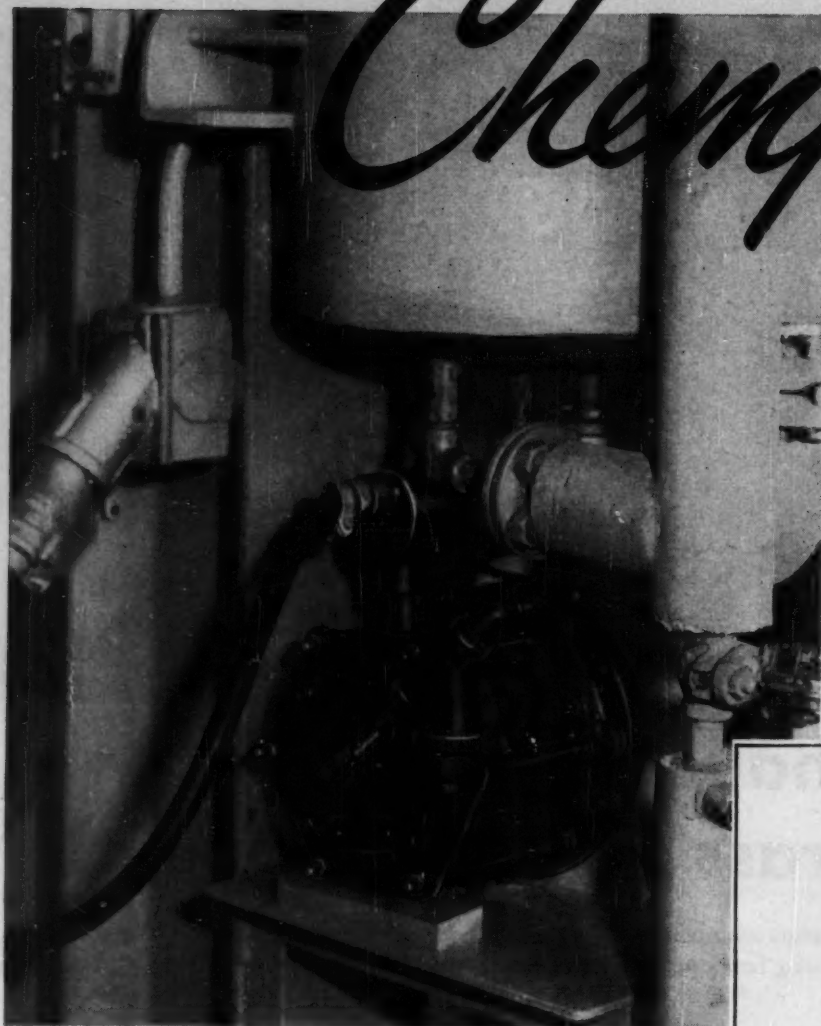
ADDRESS

CITY

ZONE

STATE

Chempump

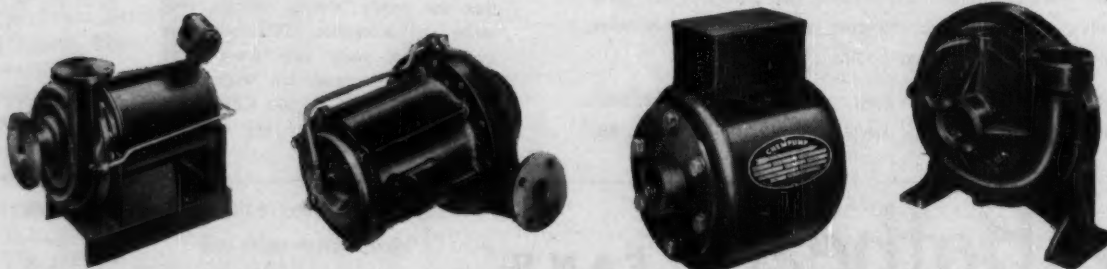


This *Chempump*, installed at American Viscose Corp., is a $\frac{1}{3}$ hp stainless steel unit which circulates sulfite liquor (magnesium bisulfite containing excess SO_2) through a digester in the sulfite pulping of wood chips. Temperatures range from 100 to 150°C (212 to 302°F). Ambient pressure is approximately 100 psi.

Chempump combines pump and motor in a single hermetic unit. Pumped fluid is allowed to enter rotor chamber of motor; no shaft sealing device is required. Pump impeller and rotor are an integral unit, isolated from stator section by a corrosion-resistant, non-magnetic liner. Pumped fluid cools bearings, rotor and stator, and lubricates bearings.

Approved by Underwriters' Laboratories. Available in wide choice of materials... from $\frac{1}{4}$ to $7\frac{1}{2}$ hp. Capacities to 250 gallons per minute. Heads to 195 feet.

Chempump can't leak!



Chempump—first in the field...process proved

gives superior performance . . .

at American Viscose Corp.

*Only Chempump seal-less pumps
provide these cost-saving benefits:*

- No seals, no stuffing boxes . . . can't possibly leak . . . ends fluid losses
- No lubrication, no external shaft, no coupling . . . virtually eliminates maintenance
- No contamination of process fluids
- Handles hazardous liquids with complete safety
- Leak-proof under extreme vacuums or pressures

Here's proof:

At the Pulping Pilot Plant of American Viscose Corp., a leak-proof *Chempump* operates eight hours a day pumping hot sulfite liquor, and is giving very satisfactory service. The pump has been in operation for over a year,

and little or no maintenance is required. The *Chempump* is far superior to ordinary centrifugal pumps with mechanical or hydrostatic seals. Previous experience with these latter pumps was very discouraging.

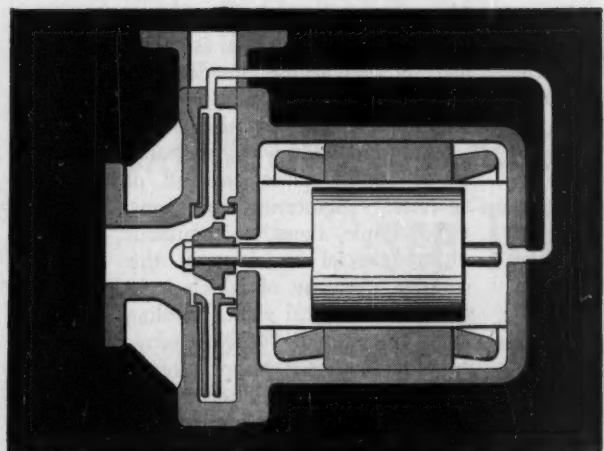
Combining motor and pump in a single unit, *Chempump* is the most significant advance in pump design in half a century. Normally hard-to-handle fluids—volatile, toxic, corrosive, explosive, "hot," or sensitive—just can't leak or become contaminated. The only maintenance required is a simple bearing change . . . made when required after periodic inspections . . . without special tools . . . with only minimum down-time.

Your process can benefit through *Chempump* application, too. For more information, send today for new 16-page Bulletin 1010, just off press.

Engineering representatives in over 30 principal cities in the United States and Canada.

Chempump

CHEMPUMP CORP. • 1300 E. MERMAID LANE • PHILADELPHIA 18, PA.



Please send me details on *Chempump* for:

(application) _____
Capacity _____ Total dynamic head _____
Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

These Industries . . . Have Chemical Engineering Problems Involving . . .

Jewelry	Electrochemical processes, vacuum metallizing, water treatment, metal cleaning, coating, coloring, metal recovery and waste disposal.
Laundry	Water treatment, fluid flow, leaching, heat transfer, centrifuging, drying.
Toys	Electroplating, plastics molding, adhesives, selection of protective and decorative coatings.
Food	Heat transfer, fluid dynamics, evaporation, size reduction, distillation, filtration, corrosion, quality control, process design, instrumentation.
Plastics	Fluid flow, heat transfer, mixing, size reduction, process instrumentation.
Plus . . .	
Municipalities	Water treatment, waste disposal, pollution control.
That's Why . . .	

You've a Spot in Non-Chemical Industries

S. RICKLIN

IF YOU'RE willing to take a broad view of a chemical engineer's abilities and functions and if you'd like to tackle new problems—problems of a slightly different nature than those you're used to facing—there's a spot for you in the non-chemical industries.

What do we mean by the "non-chemical industries?" There are, of course, many industries which consume and process chemicals and which employ many chemists and chemical engineers. Hence such "chemical process" industries

S. RICKLIN is a consulting chemical engineer who specializes in the problems of non-chemical industries. He formerly taught chemistry at Brown University.

as rubber, paper, paint, etc., are well known for this and need no further discussion.

But there are also many other industries, not thought of as chemical, which use chemical processes and have problems amenable to a chemical engineering approach. Generally, management in these industries is totally unaware of the chemical engineering aspects of their technical problems.

In my own experience as a consultant, I have yet to encounter an industry which does not have chemical engineering problems in a broad sense.

Many Are Commonplace

Some examples of industries in which I have found my training,

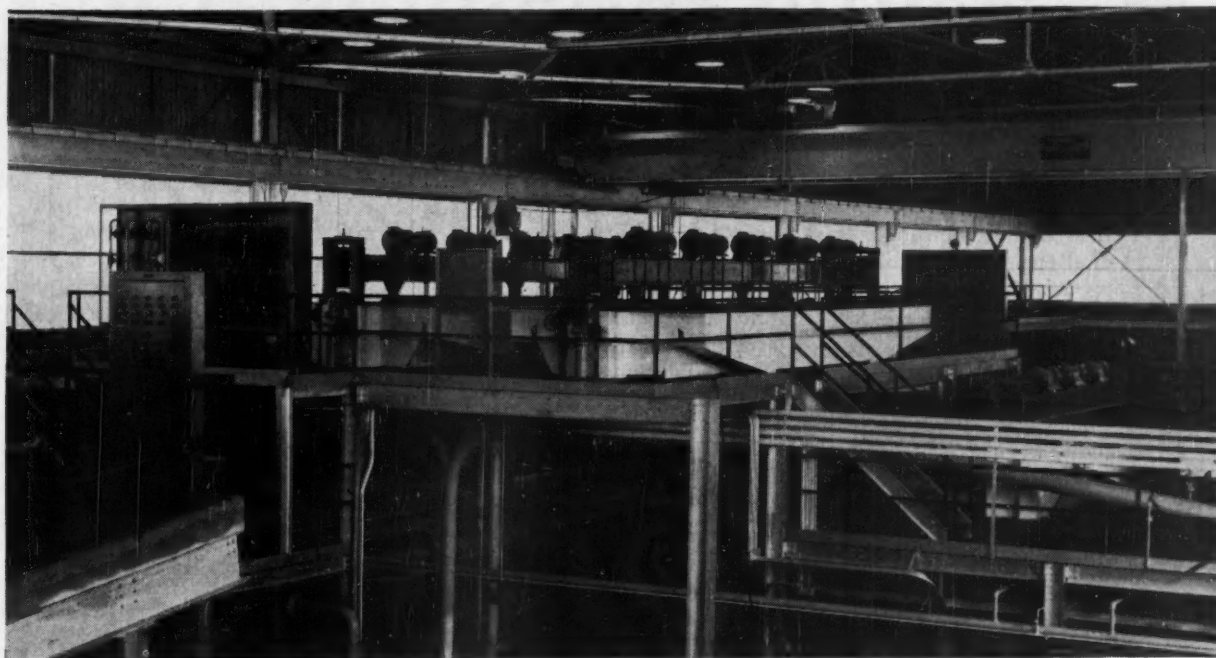
experience and method of attack useful are: jewelry manufacture, plastics molding and compounding, electronic assemblies, snap fasteners, silver tableware, scrap fish processing, syrups, etc. None of these industries is classed as chemical, yet they all use chemical materials, chemical processes and many of the unit operations.

Many industries which we think of as commonplace are full of chemical engineering problems. For example, there are thousands of commercial laundries in this country, everyone of which is in essence a chemical plant, handling large amounts of such chemicals as water softeners, soaps, detergents, sours, bluing, bleaches, and using such unit operations as fluid

Turbo-Topics



**TURBO-MIXER, a division of
GENERAL AMERICAN TRANSPORTATION CORPORATION**



**for help with
minerals
beneficiation and
extractive metallurgy,
see TURBO**

Minerals beneficiation and extractive metallurgy methods are not new here! Turbo recommendations are based on actual production experience with units in continuous operation for more than 20 years.

Turbo specialists approach your individual needs from an engineering standpoint. Every factor bearing on maximum performance and minimum maintenance is tested extensively in our laboratory.

From the very beginnings of modern extractive metallurgy, Turbo-Mixer has been able to supply help to research and production teams.

Write for general bulletins and ideas in connection with: *Conditioning, flotation, storage of high solids pulps, leaching, repulping, autoclaving.*



SALES OFFICE: 380 MADISON AVENUE, NEW YORK 17, NEW YORK

General Offices: 135 S. LaSalle St., Chicago 90, Illinois • Offices in all principal cities

**OTHER GENERAL AMERICAN EQUIPMENT:—DRYERS • DEWATERERS
TOWERS • TANKS • PRESSURE VESSELS**

"The engineer must be able to see the chemical engineering aspects of problems in the unfamiliar terrain of non-chemical industries."

flow, heat transfer, drying, centrifugation, leaching, filtration, etc., to remove impurities from textile materials.

In recent years the food industry has made wide use of modern technology, and many large food companies maintain extensive chemical and engineering facilities. There are still, however, a great number which operate pretty much as enlarged kitchens. The chemical engineer can find plenty of opportunities here.

What Sort of Problems?

What kinds of problems do you run into in non-chemical industries, and how successful is the chemical engineering approach? Perhaps this can be best demonstrated by the story of my experiences with the Dixon Corp. of Bristol, R. I. Five years ago, the company's sole business was the production of textile machinery saddles—cast iron half bearings used to weigh the rolls on yarn drawing equipment. Dr. J. S. Coles of Brown University and I were asked to develop a bearing which would operate without lubrication.

Various known "dry" or self-lubricating bearings were tried without success. Teflon (polytetrafluoroethylene) seemed most promising because of its low coefficient of friction, but it was felt that its wear resistance was too low for this application. Experiments with the addition of fillers to Teflon eventually resulted in the development of Rulon,* a composition combining most of the chemical inertness of Teflon with a very high wear resistance when operating as an unlubricated bearing and with a coefficient of friction as low as 0.12.

*Registered trademark of the Dixon Corp., Bristol, R. I.

Development of Rulon led to the design of production equipment. And, because of its similarity to Teflon, to the development of equipment for Teflon processing.

Chemical engineering problems encountered in the course of the work included:

- Preparing Teflon-filler formulations. This involved dry grinding and blending or wet mixing, filtration and drying.
- Developing equipment and procedures for testing and evaluating the compositions tried.
- Preparing quality control procedures.
- Designing special equipment for processing Teflon and Rulon.
- Designing extrusion equipment for making thin walled tubing. This involves simultaneous solvent removal and continuous controlled-temperature sintering.
- Product evaluation and market research on the product.

Any Others?

Problems of a chemical engineering nature are also found in the costume jewelry industry. Manufacturing jewelers do little research and development on their own, relying heavily upon the development work and sales service laboratories of material suppliers.

This industry involves electroplating processes, washing operations, plastics molding, vacuum metallizing, enameling, water treatment, recovery and waste disposal systems, etc. While for many companies, cost is not as important as design and novelty considerations, there is still plenty of room for the chemical engineer in process improvement.

There has been a transition in the toy industry from small hand-

labor specialty producers to large mass production factories. Many of the problems mentioned above for the jewelry industry exist here, too. Introduction of new materials calls for new manufacturing techniques—many chemical in nature.

Municipal problems, too, are often on the chemical side. The importance of chemical control in water treatment—which involves filtering, softening, de-ironizing, chlorination and fluoridization—has changed water works operation into more and more of a chemical engineering problem. Other problems include air pollution, waste and sewage disposal.

What Is Required?

An engineer familiar with such topics as corrosion prevention, lubricants, organic finishes, metal finishing, and the whole range of unit operations will find that these are also of interest to every manufacturer—regardless of product.

What the engineer must develop is the ability to see the chemical engineering aspects of technical problems in the unfamiliar terrain of non-chemical industries. He must constantly adapt himself to new situations and often to strange-sounding terminology.

A lively curiosity is essential.

How to Go About It

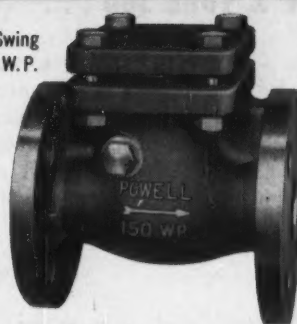
Examples and illustrations cited here are merely typical opportunities, undoubtedly many more exist. However, selling chemical engineering help to non-chemical companies is not always an easy job. Few industries have the willingness to risk money on research and development that one finds throughout the chemical industry.

The chemical engineer who wants to take a crack at the problems of a non-chemical industry must first learn what these problems are and second make himself and his abilities known to others.

First step is to determine the nature of the technical problems in that field. This can be done by reading the trade journals of the industry, contacting trade associations and attending meetings of people in the industry. (Cont.)

POWELL VALVES ... THE COMPLETE QUALITY LINE ... POWELL VALVES

FIG. 2342—Flanged End Bolted Cap Swing
Check Valve for 150 Pounds W.P.



POWELL CORROSION RESISTANT VALVES

FIG. 2495—Double Disc Flanged End
O.S. & Y. Gate Valve for 150 Pounds W.P.

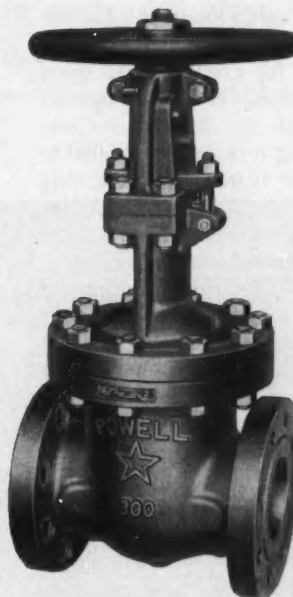


FIG. 2475—Stainless Steel O.S. & Y.
Globe Valve for 150 Pounds W.P.

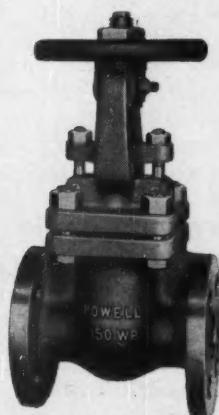
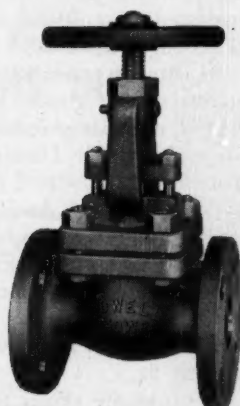


FIG. 3003 SS—High Pressure Service Alloy
Steel Gate Valve for 300 Pounds W.S.P.

POWELL VALVES ... THE COMPLETE QUALITY LINE ... POWELL VALVES

Powell can supply exactly the corrosion resistant valves you need... in a **WIDE VARIETY** of metal and alloys and all designs. You can be certain that every Powell Valve will give you dependable flow control.

Shown above are a few Powell Corrosion Resistant Valves. Investigate these... and the *complete* Powell line of quality valves that have a proven record of long, dependable service.

If no distributor is near you, we'll be pleased to tell you about our complete line, and help solve any flow control problem you may have. Write...

The Wm. Powell Company,
Cincinnati 22, Ohio **109th year**

At industry meetings you will also have the opportunity to meet and become acquainted with men in the field, and to make business contacts. It will also be part of the solution to your second prob-

lem—making yourself and your abilities known.

Publishing articles in the various journals is probably the best way to gain the reputation needed to establish yourself in the field. Di-

rect advertising and personal contacts are other valuable ways.

Once the way is opened, opportunities are limited only by the engineer's own ingenuity and ability.

VACATIONS

. . . How Long, How Often

In contrast to the popular picture of the business executive who only drops in at the office on his way from sunbathing in Florida to hunting in Maine, the average industrial manager is an overworked cuss who can never seem to find time to squeeze in the vacation he needs.

That's the gist of a recent American Management Association survey of corporate vacation policies and practices.

AMA's survey dealt with the formal plans and informal practices on vacations for executive and other salaried employees in 70 companies throughout the country. Companies ranged in size from 3,000 to more than 50,000 employees; they were a mixed-up lot, including banks, utilities, oil, chemical, and other manufacturing concerns.

Sixteen participating firms report separate formal vacation policies for executives; 12 handle executives vacations separately, but informally; another 16 claim formal policies covering all salaried personnel—but readily make exceptions for executives. The remaining 26 treat all salaried men alike.

For executives, the specific vacation allowances vary from a two-month maximum at the age of 60 for senior officers to a two-week minimum for all management levels after a year's service.

Surprisingly, most of the companies with more liberal vacation policies were also in the group whose policies were most highly formalized. Two allow one month in summer and one to two weeks in winter, although one company permits winter vacations to vice presidents only. Three companies give five weeks, although one limits this

to its top six executives. Seven permit one month—in four cases this goes to all executives, in two cases it's for top-level men only and in one case for junior officers.

Up to top-level management, length of service is the basis for deciding the length of vacations. Generally, it runs two weeks after one year, three weeks after 10 to 15 yr., and about a third grant four weeks after 25 yr.

For top men, on the other hand, most companies differentiate on the basis of the level of executive responsibility. One company uses salary, with \$20,000 per year the dividing point—if you make less you get three weeks, more four.

If you want to keep executives on the job, let them set the length and dates of their own vacations. Eleven companies let their executives do this, and several of these voice the peculiar complaint that their management people don't take enough time off. Many executives, one firm complains, "hang on to the breaking point." "Generally, they are unable to take the time allowed, especially when it's more than two weeks," said another.

MANPOWER NEEDS

. . . To Hold Our Lead

Top problem facing today's research director is the finding of enough properly trained men to staff his projects. This manpower lack has sliced the volume of basic research to far below desired levels. And the cut not only threatens to hobble chemical industry progress, it also menaces national survival.

As John R. Dunning, dean of the school of engineering of Columbia University, warned the Manufacturing Chemists' Association recently, enrollments in science courses in this nation's col-

leges are barely holding their own, in some cases declining, while Soviet science schools are boosting their yearly output.

He pointed out that currently Russia graduates between two and three times as many chemists and chemical engineers as the U. S., and almost four times as many Russian students attain the doctorate status. In addition, science education and indoctrination is becoming the rule in even the primary and secondary schools.

Outstanding students are selected young and state-subsidized during their university training.

Those not picked for university training, but showing proper aptitudes, are sent to a technical school for intensive training at the technician level. Last September it was revealed that these schools graduated some 50,000 sub-professional engineers in 1953-54.

As Russian scientists and engineers assume greater managerial control of Soviet industry, their pay is rising. Dr. Dunning claims that they are now paid much better, in proportion to labor, than scientists and engineers here.

To overcome the staffing handicap and boost the volume of fundamental research, Dr. Dunning urged the MCA and the chemical industry to

- Intensify efforts to hike interest in science and engineering as a career—these should include improving the financial prospects.

- Develop a more liberal program of financial support for promising candidates—or face the prospect of the government doing the job with tax money.

- Use every public relations tool available to sell the American people on the need to maintain the world's best trained and largest force of scientists and engineers.

WILFLEY ACID PUMPS

Cost-Saving Efficiency

Long service life
with a minimum
of attention.

Economical pump
for every require-
ment.

A. R. WILFLEY & SONS, INC.

Denver, Colorado, U.S.A.

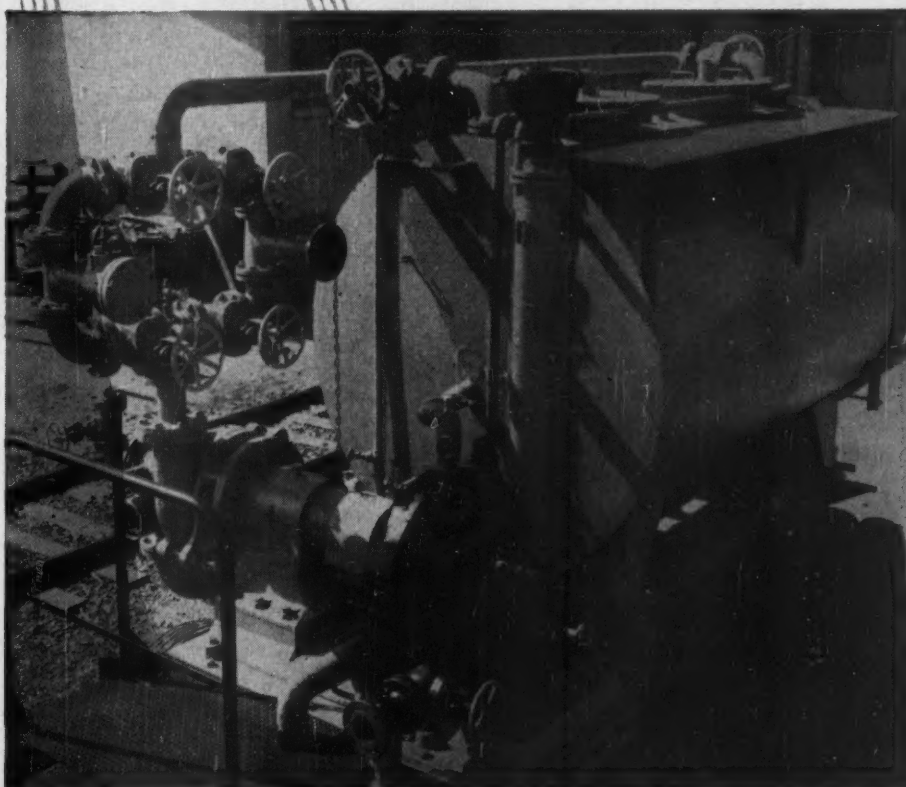
New York Office:

1775 Broadway,

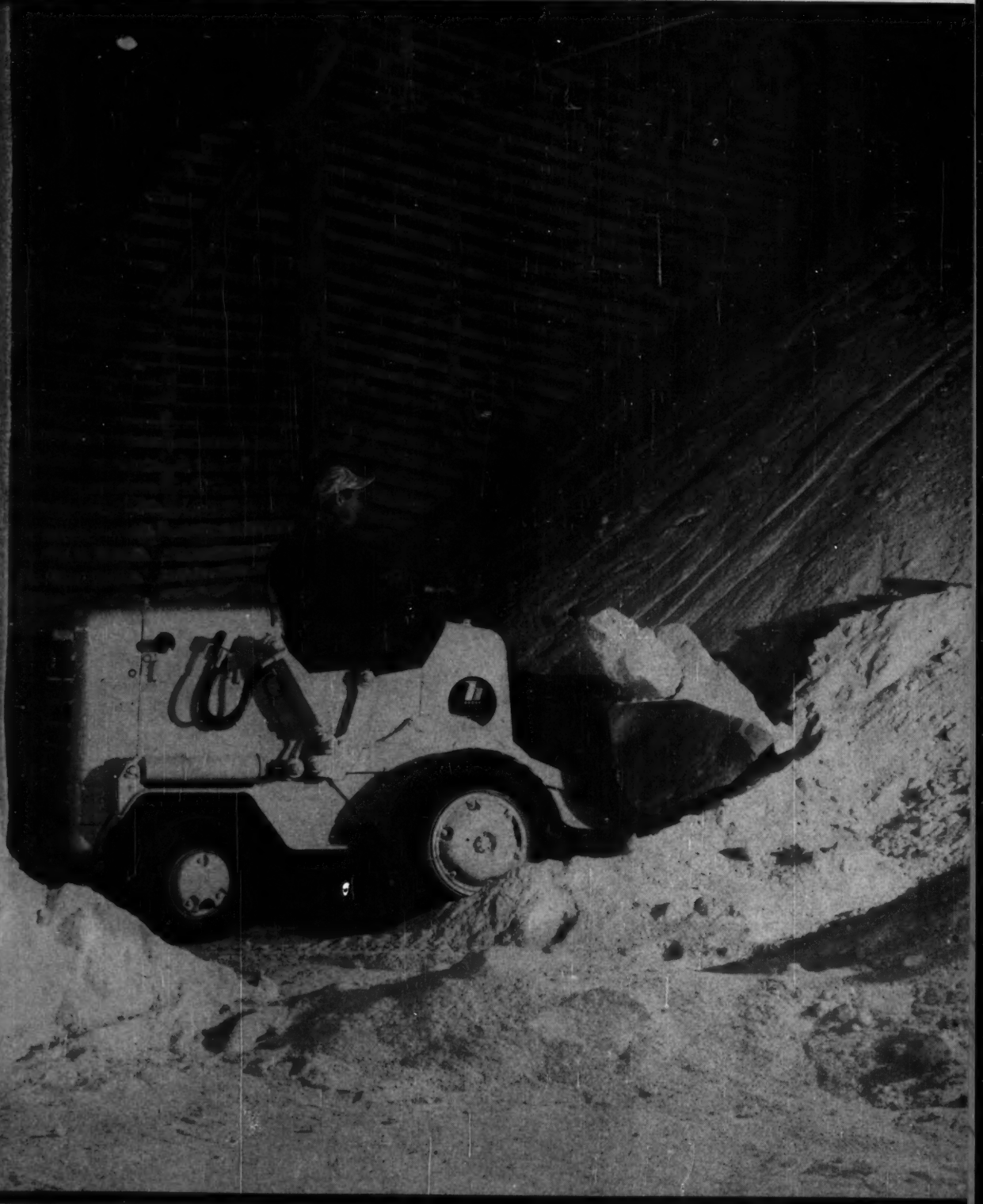
New York City



A large west coast refinery uses this Wilfley Acid Pump as part of a portable chemical cleaning unit. Here, as in other modern plants throughout the world, Wilfley Pumps consistently increase production and reduce operating costs. On even the most difficult pumping jobs these dependable, highly efficient pumps deliver continuous, trouble-free performance on 'round-the-clock schedules wherever they are installed. Available with pumping parts of the machinable alloys, as well as plastic, to meet all requirements. Individual engineering on every application. Write, wire or phone for complete details.



**A Completely New and
Different PAYLOADER®**



...years ahead in
design, construction
and performance !

Thirty four years of pioneering experience by
the manufacturer who has produced more complete
tractor-shovel units than all others put together . . .
more than three years of development and field-testing
. . . this new HA model may well set new
standards of mobile bulk materials handling
performance for industrial operations.

the NEW
model
HA



...actual performance records prove amazing superiority!

carrying capacity?

TWICE AS MUCH as previous HA model;
more than any other comparable size.

lifting capacity?

MORE THAN TWICE AS MUCH as pre-
vious; more than any other comparable size.

digging capacity?

MORE THAN TWICE AS MUCH as pre-
vious; more than any other comparable size.

bucket capacity?

16-2/3% INCREASE in (struck) capacity;
18 cubic feet PAYLOAD (heaped) capacity.

dumping height?

18 PERCENT INCREASE in maximum
dumping height over previous "HA" PAY-
LOADER model.

turning radius?

SHORTER TURNING RADIUS than before
with no increase in width, height or wheel-
base.

safety features?

SETS NEW STANDARDS of safety in load
carrying and driver protection.

production output?

INCREASED 50 TO 100% over previous
model; more than any other comparable
size.

accessibility?

IMPROVED EASE OF ACCESSIBILITY
of all service points for better maintenance.

other features?

BREAKOUT BUCKET ACTION with 40°
TIPBACK; sealed brakes; improved steer-
ing; new solenoid starting controls; new
ignition lock; hydraulic accumulator; sealed
and pressurized hydraulic tank; double-act-
ing rams; torque converter; improved buck-
et construction; dustproof distributor; hose
connectors; sealed grease fittings; new pin
lock design; improved ground clearance;
increased drawbar pull; chrome-plated pis-
ton rods; new parking brake and many
others. Send for new specification catalog.



PAYLOADER®
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY



Send me full information on the new Model HA

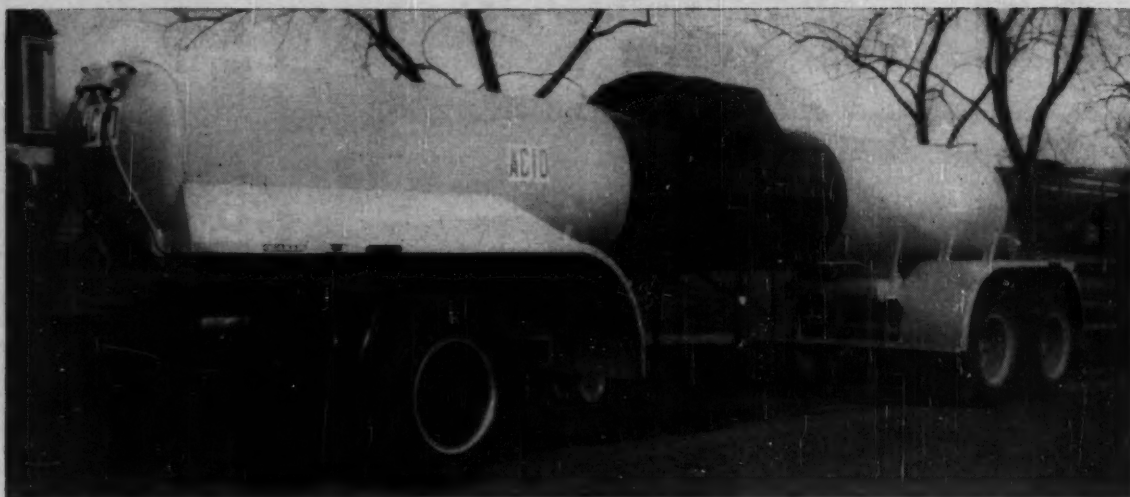
Name

Title

Company

Street

City State



TANKER COATED WITH NEOPRENE for corrosives. Chemical Tank Lines figures annual saving at \$1,600 per truck.

Acid-Truck Painting Cost Cut 85%

But biggest benefits are annual saving of \$550 per truck through reduced revenue loss due to painting downtime, 80% increase in tank service life.

Neoprene coatings applied more than two years ago have already lasted at least 12 times as long as the best acid-resistant paints on the dome and center sheet area of acid tank trucks, according to the records of Chemical Tank Lines, Inc., Downingtown, Pa. The chemical transport firm, an affiliate of Leaman Transportation Corp., first used neoprene 27 months ago. Except for slight touching up, no further work has been required.

Few services can match the corrosive conditions encountered in the "splash" area of an acid tanker. The 64 chemical tankers in the

line's fleet transport all kinds of acids—concentrated, sulfuric, nitric, muriatic, phosphoric, oleum, and various spent acids—as well as caustic soda, aluminum chloride, and other salt solutions. They range all over the country, meeting every extreme of climate and atmosphere. In addition to attack by spilled chemicals and corrosive atmospheres around chemical and industrial plants, the paint is subjected to sand-storms, hail, rain, blazing sun in the south, and 40-below temperatures on winter runs north.

Lower Painting Costs

Compared with the paint previously used, it costs Chemical Tank Lines almost twice as much for materials to coat a truck with neoprene—something like \$90 against \$50, in round numbers. Labor cost is about the same; coating a truck is a one-day job for one man. Material cost is higher partly because neoprene costs about 30% more per gallon, but mostly be-

cause the final neoprene film is three to four times thicker than most paints. Assuming a two-year life for neoprene as against two months for paint, even at twice the cost in materials, the net result is that annual materials cost for painting has been cut to one-sixth of the former figure, and annual labor cost is only one-twelfth as high. Earl D. Radcliffe, superintendent of operations for Leaman, figures the saving at better than 85%.

Less Downtime

While painting costs were significant enough, the real expense lay in another direction. When the tankers are brought in for painting, they lose about \$100 in revenue during the layup. This could mean a loss of around \$38,000 a year on the firm's 64 acid carriers. Again assuming a life of two years for neoprene—and the first application is still going strong after 27 months—revenue loss can be reduced from \$600 per truck annually to only \$50 or a cut of slightly over 91%.

Longer Tank Life

The third saving is in tank life. "Since the tanks are always hauling highly corrosive acids and other

NOTE: See "Why Go to Thick Protective Coatings?," *Chemical Engineering*, April 1954, p. 177, for reasons why coatings such as neoprene—that can be applied thick in the economical three-coat application—outlast those of "low-build" which may have equivalent chemical resistance in a given environment.—Ed.

It's my job to prevent trouble! That's why I consider "KARBATE" products wherever corrosion is a factor.



Do You Know...

- ... that "Karbate" impervious graphite is inert to a greater range of corrosive conditions than any other widely used material of construction?
- ... that the price of "Karbate" equipment compares favorably with those of less corrosion-resistant materials?
- ... that standard designs of "Karbate" equipment take full advantage of this material's high compressive strength to assure ruggedness beyond the toughest service requirements?
- ... that "Karbate" brand impervious graphite — the original and most widely used brand—is manufactured exclusively by National Carbon Company?

Don't wait until other materials fail — consider "Karbate" impervious graphite equipment *right from the start* when building a new plant or expanding present facilities. Our technical and engineering staffs are at your service.

TEST YOUR KNOWLEDGE OF **KARBATE** BRAND IMPERVIOUS GRAPHITE EQUIPMENT

The term "Karbate" is a registered trade-mark of Union Carbide and Carbon Corporation

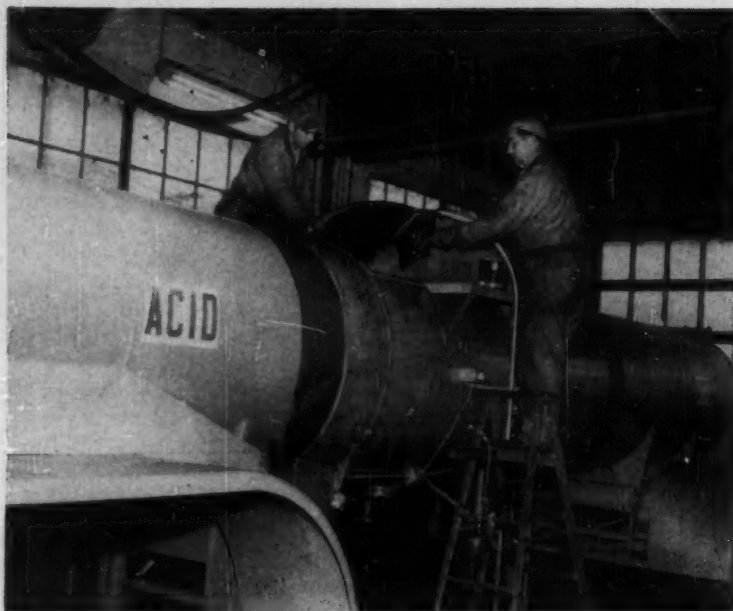
NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

Sales Offices: Atlanta, Chicago, Dallas, Kansas City,
Los Angeles, New York, Pittsburgh, San Francisco

IN CANADA: Union Carbide Canada Limited, Toronto





NEOPRENE BRUSHING CEMENT is flowed on like enamel.

chemicals, you'd expect them to fail from the inside out," says Mr. Radcliffe. "Actually, it's the other way around. Constant immersion in acid doesn't seem to be nearly so rough on the tank lining as the combination of conditions that attack coatings from the outside. Five years ago we bought 10 new tankers at around \$9,000 apiece, and all 10 are now about shot, mainly because of acid eating through from the outside. Judging from current experience, we expect the neoprene coatings to give us an extra four years of useful life."

This 80% increase in service life means that the cost of tank deterioration has been reduced from \$1,800 to \$1,000 per tank per year, for a saving of \$7,200 per truck in replacement cost.

Thicker for Splash Area

Two different types of neoprene coating are used on Leaman trucks, both manufactured by Chemical Coatings & Engineering Co., Broomall, Pa. A two-part system is preferred for the splash area in the middle of the tank. Vulcanization accelerator is stirred into the material just prior to use and three coats are applied by brushing. All other metalwork on the tank and trailer receives two coats of a one-

part neoprene maintenance paint, applied by spraying. This material is ready for use as it comes in the can.

The accelerated two-part coating is employed in the splash area because it provides a much thicker film per coat than the one-part material. Two-part coating, or brushing cement, also permits control of properties and vulcanization rate through a choice of two different activators: air-cure accelerator, for use under normal conditions; and heat-cure, for use where heating apparatus is available. The two may be used interchangeably, and each offers advantages in different situations. Heat-cure, for example, gives a build-up of six to eight mils per coat, as contrasted with 10 mils per coat for air-cure. On the other hand, heat-cure is advantageous for summer use when shop temperature is likely to be high, since it allows more time for application after mixing. Air-cure begins to set up in about 40 min. at average room temperature, and the time is shortened as temperature increases.

Steps in Application

Where a trailer is being converted to a neoprene coating, the surface is first sand-blasted to remove old paint and take corroded

areas down to bright metal. New work, which usually has a thin film of rust when the trailer is delivered, is simply wire-brushed and wiped.

Next, a primer coat is applied to the entire trailer. It dries in one to four hours, depending upon temperature, humidity, and other factors. Generally, the primer is dry at the starting point by the time the entire coat is on and the brushing cement has been mixed. Since both the primer and the coating materials are solvent solutions, ventilation is recommended and open flames should be kept away from the job.

To prepare the two-part brushing cement for use, 8 oz. of accelerator (furnished by the manufacturer) is added for every gallon of coating material. Proportions are the same for either air or heat-cure. The accelerator is yellow, and mixing should be continued until all the color is dispersed.

The coating is flowed on like enamel, working from the top down. No attempt should be made to go back over or try to brush it out. Excessive brushing or scrubbing action makes for an uneven coating and is likely to produce bubbles. If bubbles are seen on inspection between coats, a quick spraying of the special aromatic solvent used in these materials, applied with an ordinary insect-spray gun, will break the bubbles and close up the pinholes. Application is all a matter of practice—any good painter can make a neat, effective job of it, and amateurs are usually able to pick up the techniques in about a week. The job of protecting an entire trailer takes one man all day, but leaves time for other work while each coat is drying.

Where facilities are not available or fleet owners prefer to let painting work, Chemical Coatings & Engineering will make the application either on the customer's premises or in their own shops. The firm advises that similar applications of their coating materials have been made on chemical storage tanks and processing equipment in chemical plants, with equally outstanding results, and that interest along these lines is growing rapidly.

For the **toughest** service!

(for hot, concentrated sulfuric acid and other corrosives too severe for the stainless alloys)

The New
**DURCO Type M
Y Valve**

All parts in contact
with the solution are
**DURIRON or
DURICHLOR**



Corrosion resistant exterior trim: Yoke, yoke flange, gland, and gland follower are of Durimet 20. Bolts, nuts, and yoke bushing are of 18-8.

Valves are furnished with Teflon V-ring packing for positive stem sealing.

Sturdy construction throughout for maximum service life.

TYPE M VALVES IN DURIRON
ARE AVAILABLE FROM STOCK
IN SIZES 1" THROUGH 6"

THE DURIRON COMPANY, Inc.
Dayton 1, Ohio



Write for Bulletin V/8

To date, 45 of Chemical Tank Lines' 64 tankers have received neoprene coating, and the balance are being converted at the rate of about one a week. Although neoprene's first cost is higher, its longer life has resulted in large savings through reduction of net painting costs, virtual elimination of downtime for painting, and longer tank service life. Annual savings run to \$1,600 a truck.

Need to Know More About Ductile Iron?

A series of conferences designed to acquaint engineers with the properties and applications of ductile iron has been inaugurated by the International Nickel Co., whose Development and Research Division invented and developed this new material. Since it was first produced commercially in 1949, ductile iron has established itself as an important engineering metal.

Individual meetings—attended by design engineers, materials engineers, purchasing agents and representatives of management—are being held for companies employing cast or wrought components. The first of these conferences have been held at the Worthington Corp., Harrison, N. J., and at the M. W. Kellogg Co., New York, N. Y. Inco speakers were R. E. Savage, of the Ductile Iron Section of the company's Development and Research Division, and W. C. Meams, head of the division's Central Atlantic Coast Field Section.

Discussion at the conferences centers on the mechanical properties of ductile iron, design, manufacturing, specifications, heat treatment, applications and service performance.

Ductile irons are a family of cast metals. They have the processing advantages of cast iron—good fluidity and castability, ready machinability and low melting point—combined with many of the engineering advantages of steel (good strength, toughness, wear resistance and substantial ductility).

Not subject to size limitations, ductile iron castings have been produced commercially in weights

varying from 2 oz. to 100,000 lb., with section thicknesses between one-tenth of an inch and 48 in., and in intricate shapes.

What Type Packing With Hydraulic Fluids?

"What type of packing or gasketing material should I use with a certain hydraulic fluid?"

Answers to this question, often asked by the hydraulics engineer and machine designer, were offered in a recent paper presented at the National Conference on Industrial Hydraulics, Chicago. Author is H. C. Crosland, technical director of the Sirvene division, Chicago Rawhide Mfg. Co.

The paper was one of 19 covering 10 fields of industrial hydraulics applications presented at the conference, sponsored annually by the graduate school of Illinois Institute of Technology and its affiliate, Armour Research Foundation.

The analyses follow:

► **Halogenated Hydrocarbons**—such as the RPM fluids. Very rough on synthetic rubber packings. A low-swell Buna N compound would be the best recommendation when temperature ranges from 0 to 250 F. Application should be checked because of possible volume increases of 30 to 40% with this type of fluid. Teflon or Kel-F, correctly designed, can be used with this and any of the other fluids. None appear to affect these two materials, and limitations of their use are physical limitations rather than effect of fluids on them.

► **Phosphate Esters**—such as Skydrol or Pydraul. Seals and packings made from butyl rubber or silicone are entirely satisfactory. Tests run as high as 212 F. indicate only nominal volume increase and durometer decrease with these two, properly-compounded. Seals recommended for hydrocarbon base fluids are not usable when a switch is made to non-flammable phosphate esters.

► **Water Glycol Types**—such as Hydrolube and Houghtosafe. Depending on the type of seal required and the temperature range involved, Buna N, neoprene, silicone and

butyl all are satisfactory with this class of fluids, which was one of the first to reach widespread use. These fluids give little trouble on all types of sealing applications in hydraulic systems, although different brands affect synthetic rubber compounds differently. At 212 F. a volume change of 1 to 25% can be found depending on make of fluid and type of synthetic rubber.

► **Silicone Fluids**—Good because of their excellent viscosity index. Sealing these fluids is more a design problem than a compounding one. Most synthetic rubbers will shrink when in contact with silicone fluids. The Buna N materials, low in acrylonitrile content, have a very low shrinkage when in contact with these fluids and appear to lend themselves best to this work. Also helpful are the silicone fluids having viscosities in excess of 100 centipoise because they have less effect on the rubber than those with low viscosities.

► **Tricresyl Phosphate**—known also as Lindol HF. Special care must be taken in selecting packing and gasket stocks. Normal applications are adequately taken care of by butyl rubber base synthetic rubbers. Silicone base compounds have been used with great success in some cases. But softening or tenderizing can be expected on both compounds at temperatures above 212 F.

► **Carbonated Diphenyls**—of which type Arochlor 1248 is typical. At regular temperatures, Buna N, GR-S butyl rubber, or silicone base compounds are satisfactory. But the field narrows to silicone base compounds as temperatures are increased. Careful selection of the compound to the application is stressed again here.

► **Soluble Oils**—produced by various oil companies. None of these present a particular problem to the rubber compounder. The correct compound can be supplied for each application. Buna N's, neoprenes, and silicones can be used and can be properly sealed through a temperature range of -65 to 350 F. with the organic polymers. The temperature range can be enlarged with use of Teflon and Kel-F.



HEADQUARTERS FOR SPECIAL ALLOY STEEL FLANGES

25" I.D. TO 185" O.D.

You can depend on Midvale's complete facilities—melting, rolling and forging, and machining—to produce alloy flanges to the following specifications:

All standard grades of chrome-molybdenum steel from .5% chrome—.5% moly up to and including 9% chrome and 1% moly.

Carbon steel, AISI 2317 and chrome, copper, nickel steel to meet Charpy specifications for low temperature service.

All stainless steel generally required, such as 12-14 chrome and austenitic steels types 304, 316 and 347.

If your engineers require flanges of any unusual specifications call on Midvale.

THE MIDVALE COMPANY—Nicetown, Philadelphia 40, Pa.

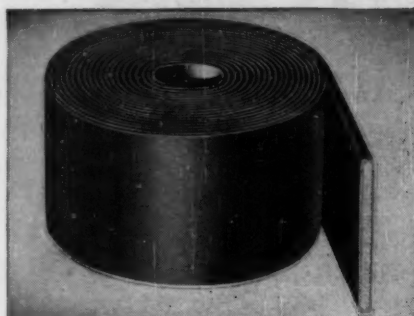
Offices: New York, Chicago, Pittsburgh, Washington, Cleveland, San Francisco

MIDVALE

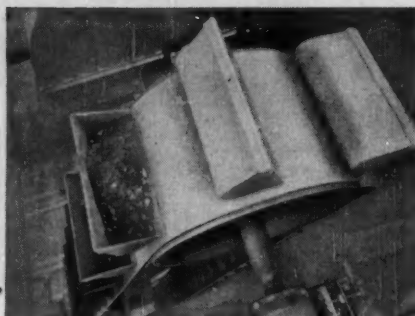
FORGINGS, ROLLS, RINGS, FLANGES, STAINLESS STEEL CASTINGS



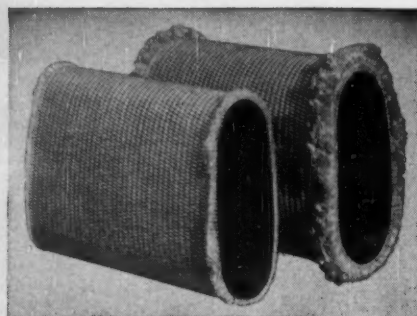
Engineered to Give



CONVEYOR BELTING



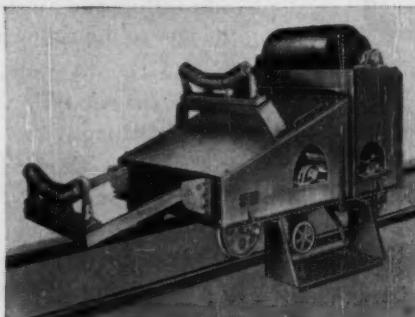
ELEVATOR BELTING



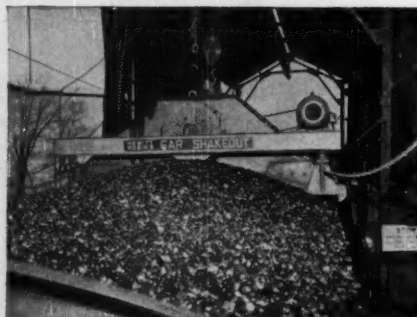
MONARCH® FIRE HOSE



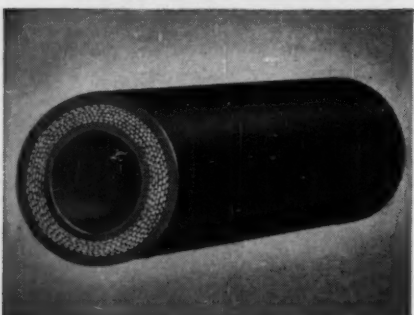
ENGINEERED-CONVEYORS



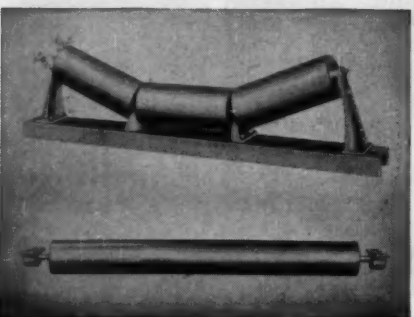
TRIPPERS



CAR SHAKEOUTS



AIR HOSE



IDLERS

Bulk Materials Handling Systems and Equipment for Chemical Processing

Whether your problem is the handling of solid or liquid materials . . . dry classification . . . feeding or blending of solids in bulk . . . Hewitt-Robins can provide you with the right answer. Because Hewitt-Robins is the only firm in its field which designs, engineers and constructs specialized bulk materials handling and processing equipment to meet all the requirements on every job.

Hewitt-Robins Engineering Division has engineers whose past experience qualifies them to solve almost any bulk materials handling and processing problem which might arise.

Hewitt-Robins Machinery Division manufactures a complete line of spe-

cialized machinery for conveying, screening, sizing, elevating, distributing, blending and storing loose bulk materials of every description.

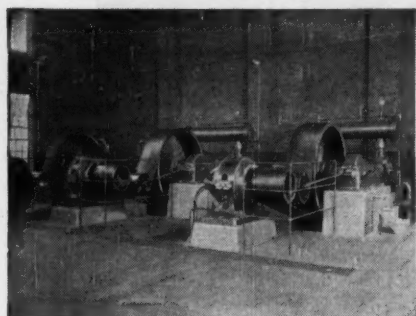
Hewitt-Robins Rubber Division produces a wide range of rubber conveyor belts, transmission belts, industrial rubber hoses and molded rubber products.

By dealing with Hewitt-Robins you'll save time and trouble . . . our combined divisions will furnish you with better integrated bulk materials handling systems and better designed and constructed processing equipment to solve every chemical processing problem.

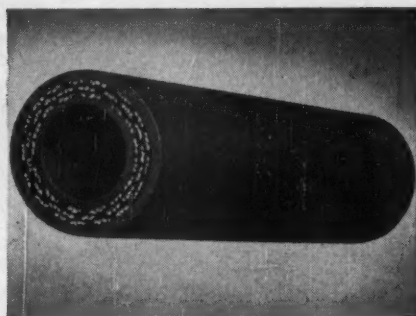


HEWITT-ROBINS
EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

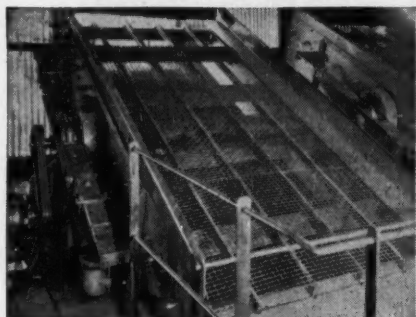
You Better Service



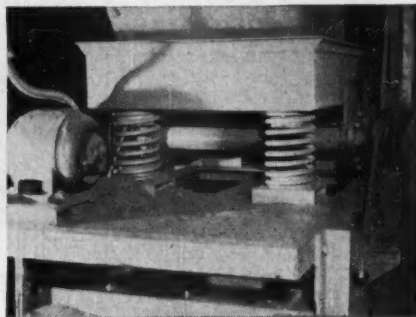
TRANSMISSION BELTING



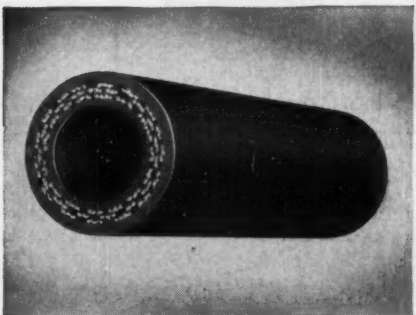
STEAM HOSE



GYREX® SCREENS



FEEDERS



WATER HOSE



PINCH VALVE HOSE



STACKERS



SECTIONAL CONVEYORS

INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City

CHEMICAL ENGINEERING—February 1955

*Here is a partial list of
HEWITT-ROBINS PRODUCTS
 that will help you
 cut handling costs and
 increase operating efficiency.*

MACHINERY

Belt Conveyors
 Belt & Bucket Elevators
 Car Shakeouts
 Conveyor Idlers
 Dewaterizers
 Mechanical Feeders
 Foundry Shakeouts
 Mine Conveyors
 Reclaiming Systems
 Screen Cloth
 Stackers & Trippers
 Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

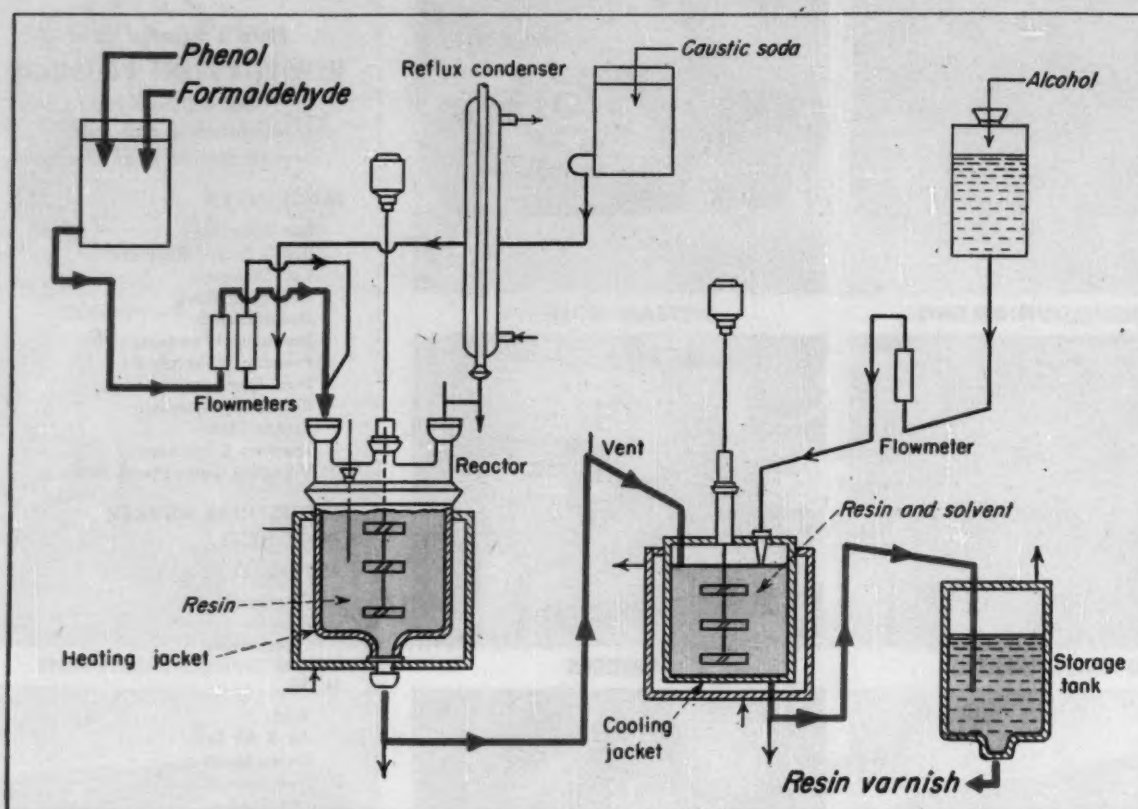
Conveyor
 Elevator
 Transmission

HOSE:

Acid
 Air & Air Drill
 Barge Loading
 Dust Suction
 Fire
 Fuel Oil & Gasoline
 Gasoline Pump
 Mud Pump Suction
 Oil Suction & Discharge
 Propane-Butane
 Road Builders'
 Rotary Drilling
 Sand Blast
 Sand Suction
 Sea Loading
 Servall®, All-Service
 Steam
 Tank Car & Tank Truck
 Vacuum & Air Brake
 Water & Water Suction
 Welding, Twin-Weld®

For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

1885



Resin Production—Batch or Continuous?

Continuous, says this company. And substantiates its claim with a one-stage process yielding thermosetting resins in less time.

In its description of a new process for preparing thermosetting resins, the St. Regis Paper Co. attempts to refute two popular arguments against continuous, one-stage resin production: (1) material gets bypassed directly to the product outlet without reaction, (2) reaction time is 10-20 times longer than batch operations.

St. Regis claims that its continuous process is no different from, and perhaps better than, conventional batch procedures because:

- Unreacted materials appear

in end products of both operations (batch process is never carried to 100% completion).

- Reaction time is cut (there are no charge, distillation, mixing and discharge periods in the new process).

This is how they get results.

► **First, Batch**—In starting up the reaction, phenol and formaldehyde are charged to the reactor in proper proportions. Next, steam is fed into the heating jacket enclosing the reactor. And the charge is brought to "foam," then refluxed—

batchwise—for about $\frac{1}{3}$ the hold-up time for continuous operation.

Water formed during condensation is removed through the partly-opened petcock of the reflux condenser.

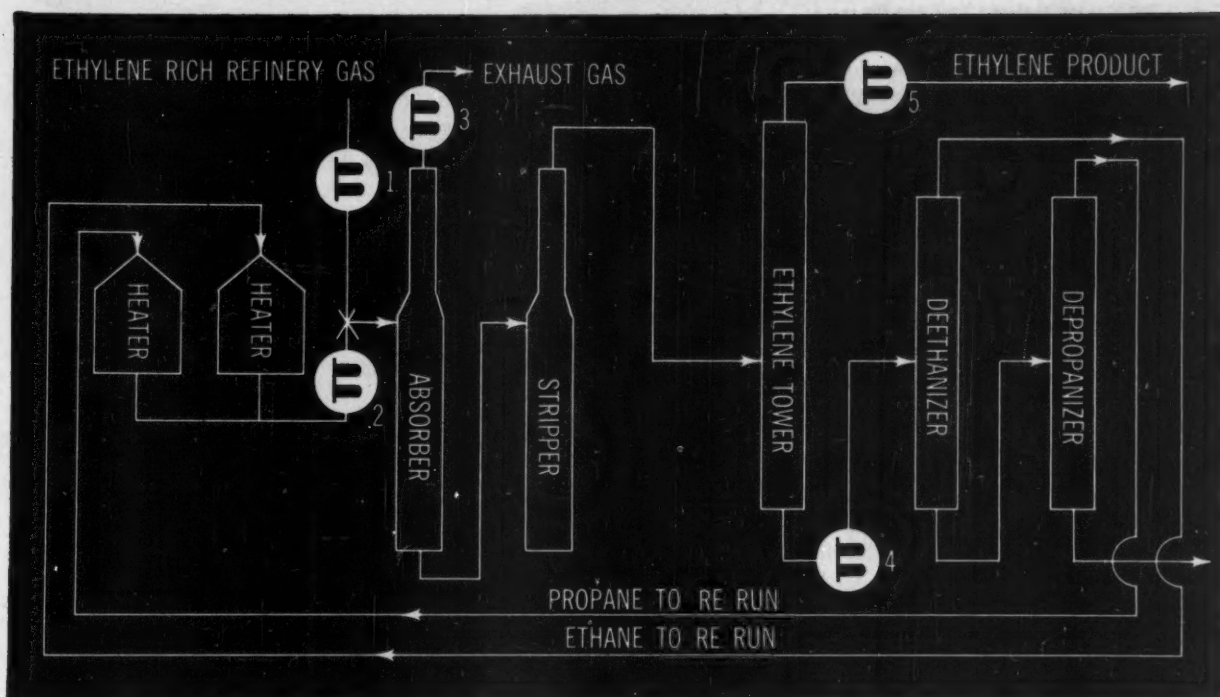
At the end of the reflux period, the reactor's contents are—except for being somewhat under-reacted—in equilibrium (such as results from continuous operation).

► **Then, Continuous**—At this point, continuous charging and withdrawal begins—the distillation rate being reduced to that calculated for continuous production.

The initial batchwise, refluxed resin is usable. Its set time is only 30-40 second higher than that produced in a continuous process.

And shutdown is simple:

TRUE CONTROL BEGINS WITH ANALYSIS...



Ethylene purity guaranteed through use of Tri-non* Analyzers

Even though many elements of process stream environment—temperature, pressure, flow-rate—are under control, a chemical process may not be operating at peak efficiency and product quality suffers.

Why?

Because, environmental control gives no indication of basic stream changes like feed stock composition, loss in stripper efficiency, catalyst poisoning, etc., all of which may effect end product quality.

In chemical processing, it is essential that true control *begin* with analysis—either batch-wise in the control laboratory, or continuously on the process stream itself.

In the ethylene purification shown above, purity and maximum recovery is guaranteed by infrared analytical control at five points: 1—Ethylene analysis on feed stock for accounting purposes and process control; 2—Ethylene analysis beyond crackers; 3—Ethylene analysis of absorber off-gas for absorber efficiency; 4—Ethylene analysis in ethylene tower bottoms for fractionation tower efficiency; 5—End-point analysis for ethylene purity.

Let Perkin-Elmer engineers show you how your process can benefit through ANALYTICAL CONTROL—made possible with infrared plant stream analyzers.

*TM—The Perkin-Elmer Corp



Both the TRI-NON and BICHROMATOR Analyzer continuously record the concentration of any desired stream component. Each is sensitized and adjusted to specific plant conditions before shipping.

THE PERKIN-ELMER CORPORATION
830 Main Avenue, Norwalk, Conn.


Gentlemen:

- ☐ Send information on the application of infrared analytical control to the following process problem:
- ☐ Send literature on your infrared plant stream analyzers
- ☐ Have a sales engineer call

Name.....Title.....

Company.....

Address.....

PERKIN  ELMER — FIRST IN ANALYTICAL CONTROL

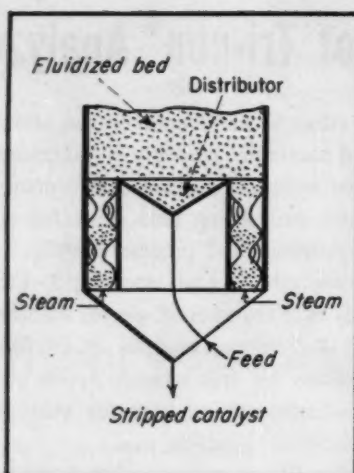
- Feeds and drawoff are closed.
- Resin is cut with an amount of alcohol equal to that used in cutting material which is continuously charged (from the reactor) to the resin and solvent mixing tank.

Resin varnish made in this way is the same as that produced continuously.

► **"Cloud Point"**—To check the reaction's progress, it's necessary to test—periodically—the product's set time.

This is done by taking a sample from the reactor, diluting it with an equal amount of water, then determining the temperature at which clouding or precipitation occurs.

This "cloud point" varies directly with the resin's set time.—U. S. 2,688,606 by George P. Schmitt and Cornelius Werberg to St. Regis Paper Co.



Hour Glass Stripping Regenerates Catalyst

Alternate compression and expansion effects rapid separation of entrained vapors from solid particles in this novel catalyst stripper.

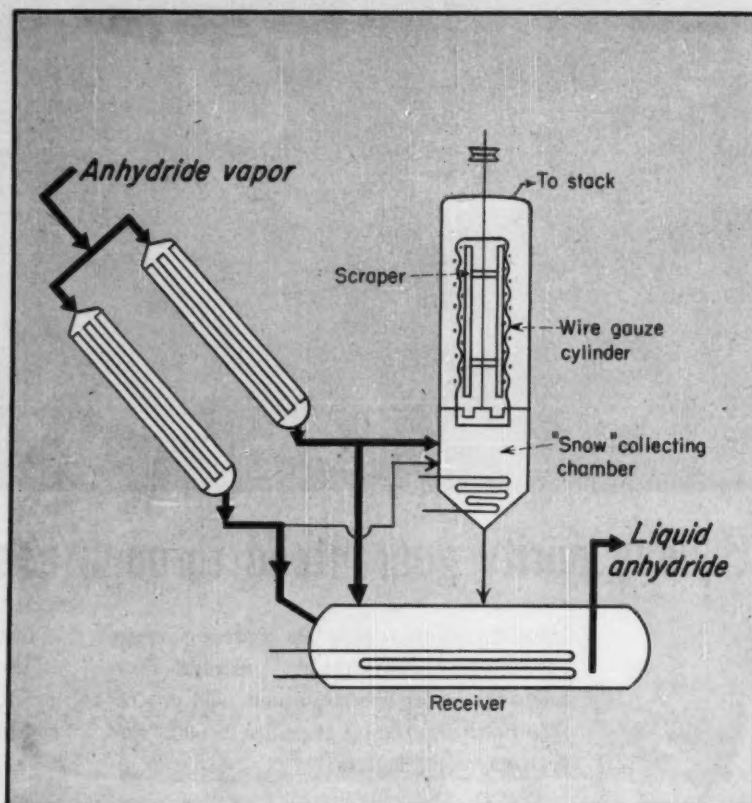
► **Hour Glass Separation**—When contamination of the fluidized bed is such as to require regeneration, catalyst is withdrawn through an annular space at the bottom of the reactor.

Steam (or other stripping medium) is then added, flowing up through a series of hour glass devices.

As the steam rises, it strips

catalyst which falls down through the wider part of one hour glass, through bypass tubes, into the next

lower hour glass.—U. S. 2,688,195 by William F. Hyer to Phillips Petroleum Co.



Phthalic Anhydride: From Vapor to Solid

The simple conversion of phthalic anhydride vapor to the solid highlights this new, semi-continuous process.

► **Condenser #1**—Anhydride vapor feeds to and solidifies in one of two condensers. Although most of the vapor condenses on the walls of the condenser tube, some condenses as "snow" in the moving gas. This is trapped by passing it through a wire gauze filter.

What about phthalic acid formation? It's eliminated—by keeping the cooling water temperature at 30-40 C. In this range there's no condensation of water along with the anhydride. Hence, no acid formation.

► **Condenser #2**—As the anhydride

cake builds up in condenser #1, it cuts down the latter's cooling efficiency. Therefore vapors must eventually be routed to a second condenser.

The solid cake in the first condenser is melted by passing steam through the condenser jacket. And liquid anhydride collects in a heated receiver.

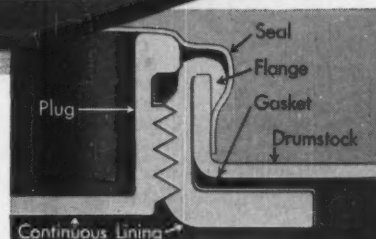
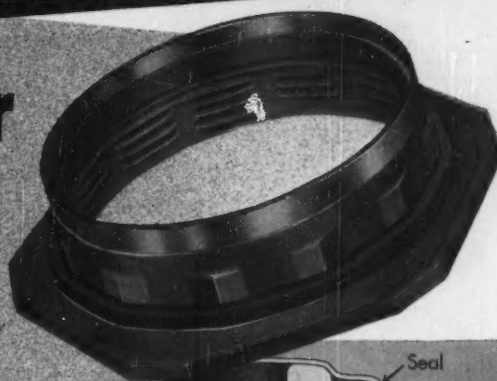
Cooling time in each condenser is about 30 minutes. Each tube—

To get any patents, including those mentioned here, order from the Commissioner of Patents, Washington 25, D. C. Each patent costs 25 cents.

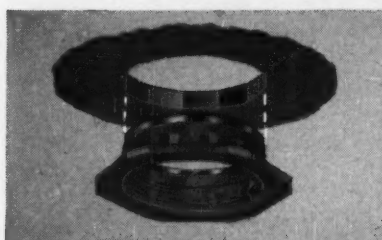
Tri-Sure® Coated Polygonal Flange

To give you better LINED CONTAINERS!

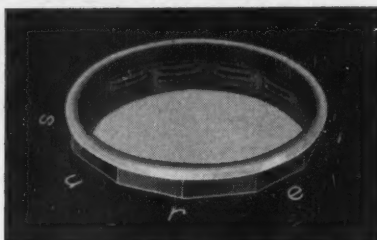
—another development in the
Tri-Sure program to help shippers
solve their container problems



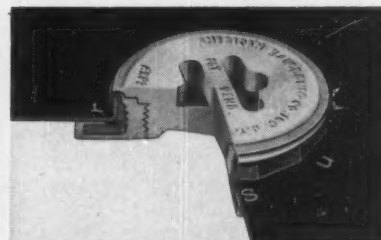
Gaskets seal off contact surfaces of flange and drumstock, maintaining the protection of a continuous lining.



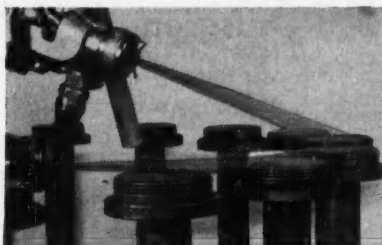
Drumstock is bent to form a collar so that neck of flange can be keyed to container when inserted.



Flange inserted in drumstock. Polygonal shape locks flange securely.



Tri-Sure Polygonal Closure—designed for products that require additional protection. Polygonal Flange is completely enclosed in polyethylene, and used with Tri-Sure Polyethylene Plug.



Spraying coating on Tri-Sure Plugs in the Tri-Sure factory. This Tri-Sure factory coating—to your exact specifications—is your assurance of obtaining coated fittings that give you maximum protection.

If your product requires protection from contact with metal, it can be shipped with perfect security in lined containers that are equipped with the new *Tri-Sure coated Polygonal Flanges*, and coated or plastic plugs.

This new Tri-Sure Flange, designed especially for lined containers, completely shields the contents of the drum from the metal of the fitting, so that the protection of the lined container is *complete*. At the same time it maintains all of the exclusive features of Tri-Sure Closures which safeguard the contents from leakage, tampering and contamination.

The Tri-Sure Polygonal Flange can be used in your full line of containers—coated, lithographed or standard—without requiring any new tools in your filling line. It can be supplied zinc-plated, tin-plated or unplated—single-coated or double-coated; or with a polyethylene overlay. It is also available in aluminum.

When ordering coated flanges and plugs, take advantage of our extensive experience in the development of coated fittings by specifying *Tri-Sure factory coated*. The fittings will be coated to your exact specifications with perfect uniformity and thorough coverage of the threads.

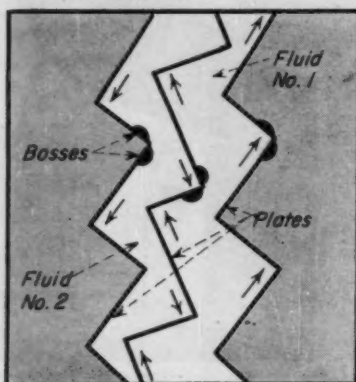
The Tri-Sure Closure using the Polygonal Flange, with or without overlay, and plastic or metal plug has I. C. C. approval.

*The "Tri-Sure" Trademark is a mark of reliability backed by over 30 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used. Tri-Sure Flanges for coated containers and Tri-Sure plastic plugs are the subjects of U. S. and Foreign Patents and Patents Pending.

Always
specify
Tri-Sure
Reg. U. S. Pat. Off.
CLOSURES

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.
Tri-Sure Products Limited, St. Catharines, Ontario, Canada

2 inches in diameter and 70 feet long—condenses 20 pounds of phthalic anhydride, excluding "snow."—U. S. 2,692,657 by Edmund Barton to Imperial Chemical Industries Ltd.



Exchanger Plates —With a Twist

Here's a neat improvement in plate heat exchanger design.

These zigzag plates (shown in schematic longitudinal section) are:

- Corrugated—providing good turbulence.
- Simply constructed.
- Easy to clean.

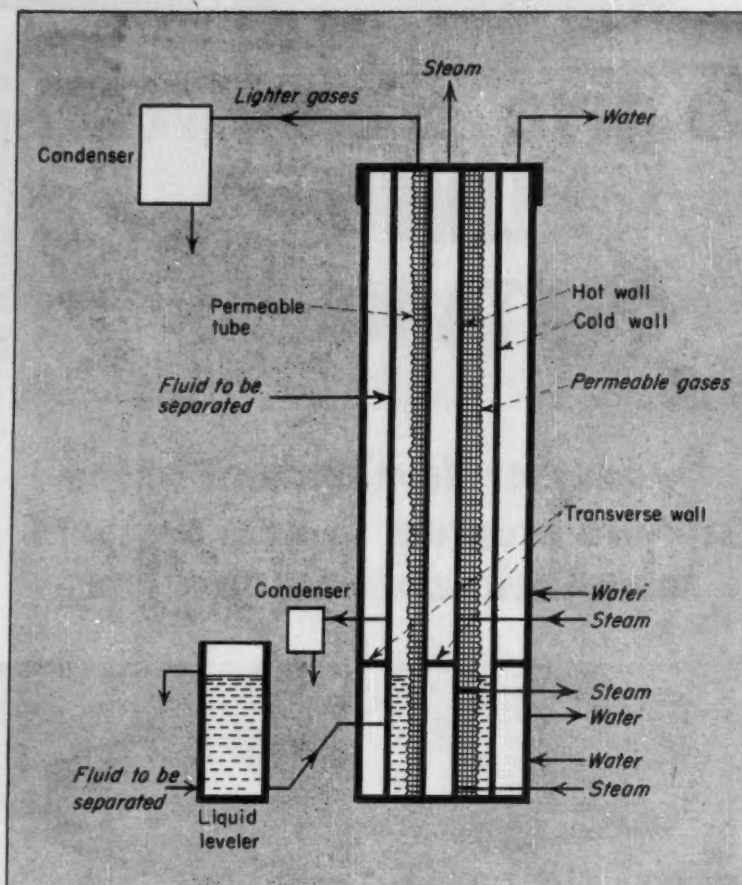
U. S. 2,687,876 by Robert P. L. Hytte to Aktiebolaget Separator.

Substituted HAC Sans Purification

Monochloroacetic acid containing less than 2% of the dichloro acid is the claim of a process patent recently granted to the New York Ohio Chemical Corp.

The improved technique is designed to eliminate purification steps—e.g. distillation or crystallization—required in conventional mono acid production.

It hinges on the addition of an ionic catalyst—preferably a metal acetate or chloride—to the reaction mixture to inhibit organic peroxide formation. It's this peroxide which, according to the inventor, induces the formation of dichloroacetic acid.—U. S. 2,688,634 by John T. Pinkston, Jr. to New York Ohio Chemical Corp.



Another Job for Thermal Diffusion

Interested in separating hydrocarbons or isotopes? Then you'll certainly want to take a look at this novel separator which **does the job** by thermal diffusion.

As shown, the separator consists of a metal cylinder containing three coaxial tubes:

- Inner tube (separator's hot wall).
- Outer tube (separator's cold wall).
- Permeable tube (between the inner and outer tube).

The annular space between the inner and outer tubes confines the fluid to be separated.

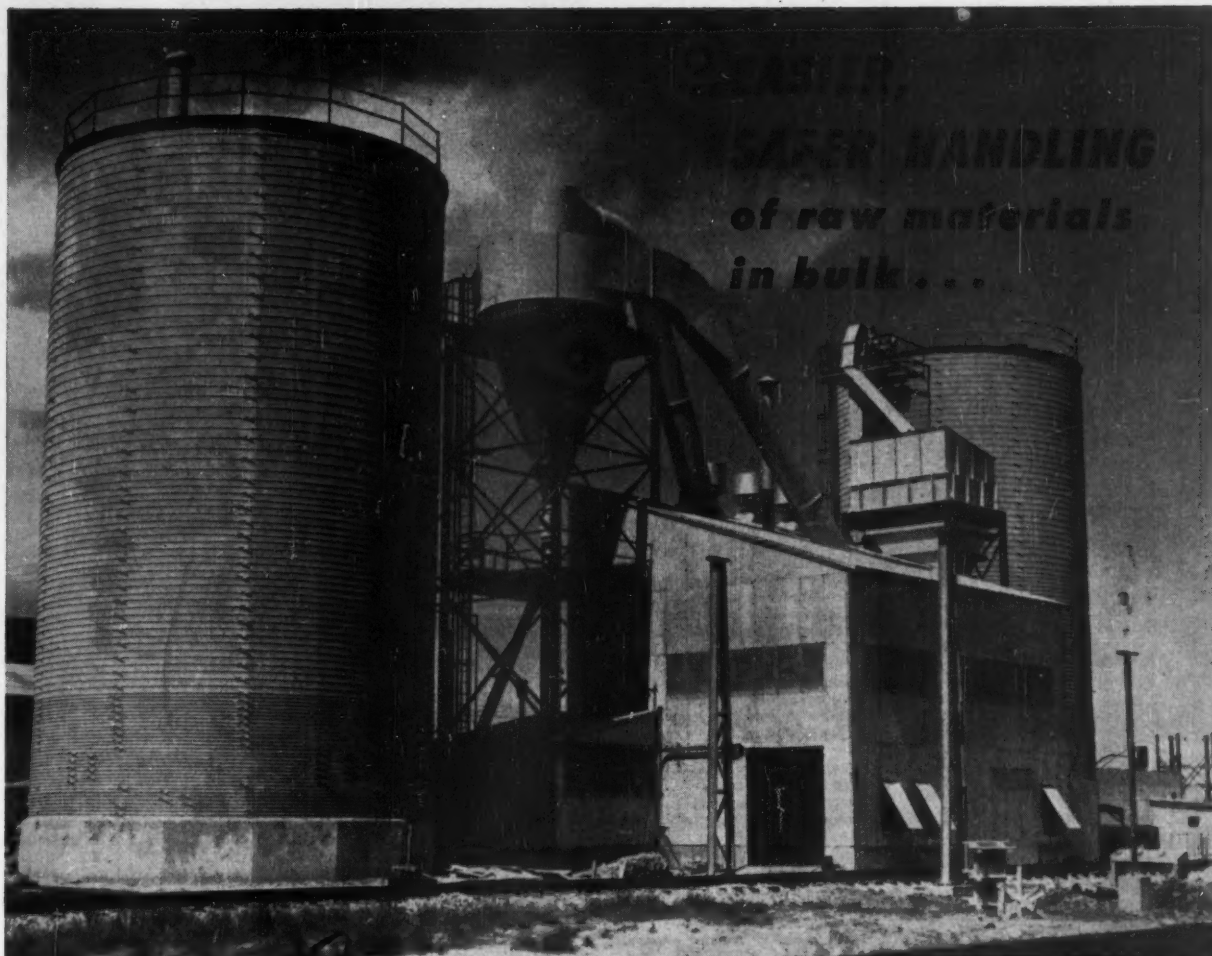
► **Tube Compartments**—Transverse walls divide—into two compartments—both the inner tube and the space between the outer tube and separator wall.

Temperatures above both transverse walls are somewhat higher than those below.

Steam (or other heating medium) enters and leaves the inner tube via two pairs of inlets and outlets—one pair, below the transverse wall; the other, above. A similar arrangement of inlets and outlets supplies water (or other coolant) to the space between the outer tube and separator wall.

► **Separation Begins**—Fluid to be separated enters the annular space—between the inner and outer tubes—via an inlet coming from a levelling device. The liquid level in this space corresponds to and is automatically kept at that maintained in the leveller.

Once this level is reached, steam and water feed, respectively, into



**PLASTER,
SAFER HANDLING
of raw materials
in bulk...**

Efficient handling of bulk materials is provided by this Marietta designed and erected storage system at Texas City Chemical Co., Texas City, Texas.

Marietta

GREATEST NAME IN SILOS

Stockpiling of raw materials is essential, but storing materials in outmoded or limited-capacity storage systems is a sure, quick path to raising handling costs. Modern Marietta storage systems are versatile. They are designed to help you make more profit by providing more efficient methods of handling materials... readily adaptable to every industrial storage need.

Single or multiple Marietta concrete storage silos

are in use today by many industries for storage of widely varied materials. Marietta precast solid or Air-Cell concrete stave construction is sturdy... durable... stressed to carry heavy top or side-mounted machinery of any type needed for your operations. Built to stay "bone dry," they eliminate waste and spoilage... keep even the most hygroscopic materials in usable condition.



MARIETTA AIR-CELL lightweight aggregate STAVES

Stronger... thicker than standard staves... an exclusive Marietta development. Give greater protection especially when dry materials are stored. Marietta precast Air-Cell staves, made from lightweight aggregate, are 3 1/4" thick and provide insulation value equal to 15" of solid concrete.

THE

Marietta

CONCRETE CORPORATION
MARIETTA, OHIO

BRANCH
OFFICES:

- 501 FIFTH AVE., NEW YORK 17, N. Y.
- PULASKI HWY. AT RACE RD., BALTIMORE 21, MD.
- BOX 5192, CHARLOTTE 6, N. C.
- 411 FOSTER ST., NASHVILLE, TENN.
- HOLLYWOOD, FLA. • JAMESTOWN, N. Y.

Representatives in Principal Cities

PRECAST CONCRETE PRODUCTS FOR FARM, HOME AND INDUSTRY

TOMORROW'S TECHNOLOGY . . .

both compartments of the inner tube and the space between the outer tube and separator wall.

► **Two Phases**—Temperatures of the lower and upper annular space are such that fluid in the former is liquid while fluid in the latter is gaseous.

The temperature differential between the inner and outer tubes causes thermal diffusion through

the permeable tube. Heavier fractions flow to the cold wall; lighter fractions, to the hot wall.

The latter exit from the top of the separator. And if additional separation is required, they are condensed, then recycled either to (1) the separator or (2) a second similar unit.

► **Permeable Tube Specs**—The permeable tube is made of metal

gauze, metal foil or alloy foil. Perforations may be as small and numerous as practicable.

The degree of permeability is not critical. However, it's essential to avoid:

- Selective diffusion by a porous membrane.

- Turbulent mixing—on either side of the tube.

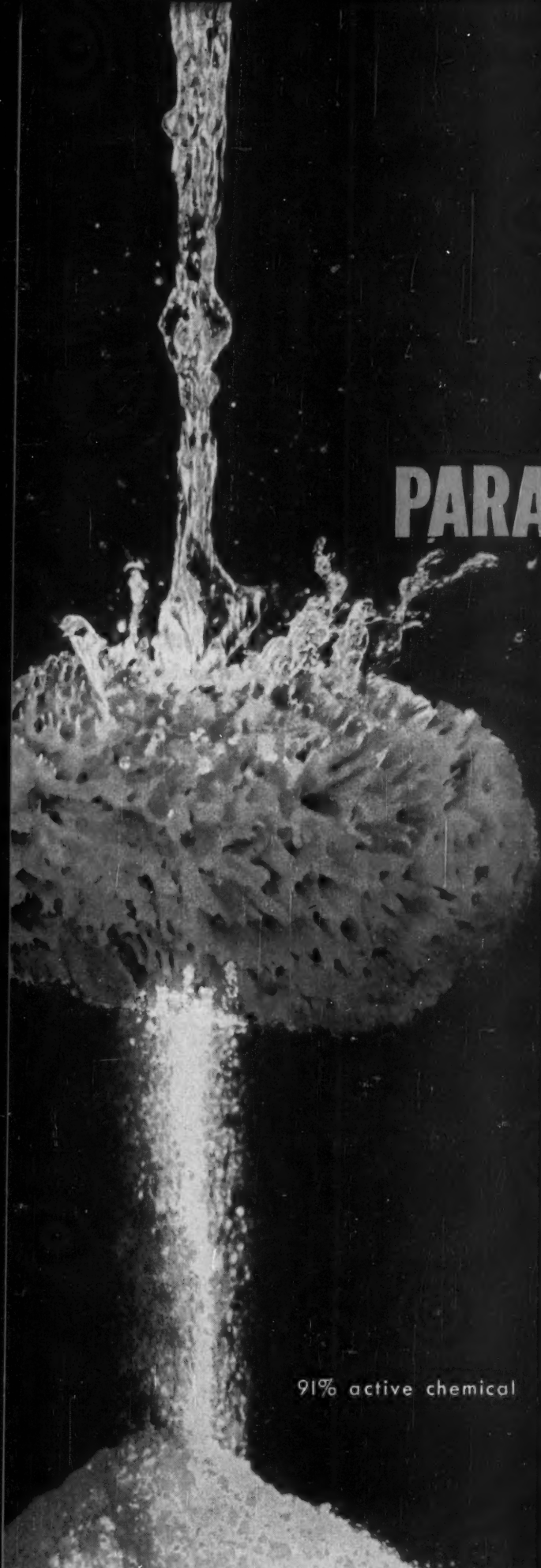
U. S. 2,688,404 by Walter Wahl.

Your Checklist of New Equipment Patents

Operation . . .	About . . .	Inventor or Assignee . . .	Patent No. . .
Adsorption	Adsorption by and reactivation of granular adsorbents	Union Oil Co. of Calif.	2,692,656
Crushing and grinding	Automatic chromatographic fractionator	The Upjohn Co.	2,692,820
Distillation	Wall plate for drum-type breaker mills	Pennsylvania Crusher Co.	2,692,087
Extraction	Total draw-off tray for fractionating towers	Standard Oil Development Co.	2,692,129
Extrusion and molding	Desolventizing solvent-extracted solid organic particles	Blaw-Knox Co.	2,691,830
Filtration	Tubing extrusion	B. F. Goodrich Co.	2,690,592
Fluid and particle flow	Thermoplastic sheet molder	The Eagle-Picher Co.	2,691,798
Heat transfer	Injection molder	Parmalee Plastics Co.	2,691,799
Instrumentation and control	Molding plastic-impregnated material with compressible molds	Joseph Robb & Co. Ltd.	2,691,801
Mixing	Filter cake thickness gage	Socony-Vacuum Oil Co., Inc.	2,691,298
Solid-gas separation	Filter leaf	Heins Eickemeyer et al.	2,691,445
Solid-solid separation	Edge filter	Charles S. Garland	2,692,685
	Self-adjusting edge filter	Wm. P. Fleck et al.	2,692,686
	Contacting a moving granular bed with gases	Houdry Process Corp.	2,690,955
	Gas-solids contactor	Standard Oil Development Co.	2,690,962
	Applying fluidized bed technique to production of CO and H ₂ from hydrocarbon gases	Standard Oil Development Co.	2,692,192
	Pebble feeder	Phillips Petroleum Co.	2,692,702
	Disperse phase countercurrent contacting of subdivided particles	Universal Oil Products Co.	2,692,864
	Heat regenerator packing construction	Carbonic Development Co.	2,692,131
	Heat transfer media	Koppers Co., Inc.	2,692,234
	Magnetic flowmeter	Phillips Petroleum Co.	2,691,303
	Apparatus for adsorption isotherm determination	Sinclair Refining Co.	2,692,497
	Liquids mixer	Howe-Baker Corp.	2,692,764
	Separator for dust-carrying gases	Pierre Diebold	2,690,813
	Sink-float mineral separation	Nelson L. Davis	2,692,048-9
	Hydraulic classification of magnetizable solids	The Dorr Co.	2,692,677

... And New Process Patents

Product . . .	Process . . .	Inventor or Assignee . . .	Patent No. . .
Fats and oils	Monoglyceride synthesis	Swift & Co.	2,691,664
Fuels	Oil deodorization	National Cylinder Gas Co.	2,691,665
Gases	Preparing a gas interchangeable with coke oven or carburetted water gas	The Institute of Gas Technology	2,692,193
Hydrocarbons	Treating coal distillation gases and vapors	Elmer H. Hyde	2,692,849
Inorganic chemicals	Acetylene and ethylene manufacture	Phillips Petroleum Co.	2,692,294
Metals and ores	Low-temperature gas fractionation	Soc. Anonyme pour L'Etude et L'Exploitation des Procédes Georges Claude	2,692,484
Organic chemicals	Acetylene from hydrocarbon pyrolysis	Wulff Process Co.	2,692,819
	Acetylene production	Hydrocarbon Research, Inc.	2,692,901-2
	Shale oil refining	Standard Oil Development Co.	2,692,226
	Azeotropic distillation—with perfluoro epds.—of straight-chain paraffins from mixtures with branched-chain paraffins	Phillips Petroleum Co.	2,692,227
	Sodium cyanate preparation	Mathieson Chemical Corp.	2,690,950-1
	Sodium sulfide from sodium sulfate	Badische Anilin- & Soda-Fabrik A. G.	2,690,958
	Production of chlorine and metal nitrates	The Chemical Foundation, Inc.	2,691,569
	Titanium dioxide manufacture	E. I. du Pont de Nemours & Co.	2,691,571
	Preparation of magnesium hydroxide	Kaiser Aluminum & Chemical Corp.	2,692,816
	Manganese concentration	Chemical Construction Corp.	2,691,570
	Separating organic acids from oxygenated organics by azeotropic distillation with H ₂ O	The M. W. Kellogg Co.	2,690,993
	Oil-soluble alcohols recovered by azeotropic distillation with isopropanol	Stanolind Oil & Gas Co.	2,690,995
	Sulfonating organic epds. with SO ₃	Universal Oil Products Co.	2,691,040
	Separation of glycols and glycol ethers	Socony-Vacuum Oil Co., Inc.	2,691,048
	Benzene hexachloride manufacture	Ethyl Corp.	2,691,051
	Purifying aromatic hydrocarbons	Jones & Laughlin Steel Corp.	2,691,054
	Azeotropic-distillation of propyl amines	Imperial Chemical Industries Ltd.	2,691,624
	Recovering benzene hexachloride by steam distillation	Ethyl Corp.	2,691,625



**formaldehyde isn't
"formaldehyde" any more...**

**For high solids resins
it's Celanese***

PARAFORMALDEHYDE

Produce more with your present equipment...

- 30% larger batches—water bulk eliminated
- $\frac{1}{3}$ shorter cycles—reflux and dehydration steps cut by hours
- greater reactivity, higher yields—lower formaldehyde-to-phenol ratio

Get your Celanese representative to show you how this shortcut to lower costs and greater resin production can fit your operation. Or write for Technical Bulletin N-30.

Celanese Corporation of America, Chemical Division, Dept. 553-B 180 Madison Avenue, N. Y. 16.

PLANNING ADDITIONAL INSTALLATION?

You can reduce capital investment by using Celanese Paraformaldehyde. No need for heated storage tanks or large storage area. Same output from smaller kettles; lower steam, electricity and cooling costs.

91% active chemical


*Reg. U. S. Pat. Off.

**ONLY CELANESE OFFERS THE RIGHT
FORMALDEHYDE FOR EVERY PURPOSE...
PARAFORMALDEHYDE • FORMCEL* SOLUTIONS
FORMALIN • TRIOXANE**

Why Rockwell-Nordstrom Cost Less to Use in ANY

Corrosion control, longer life:

In Rockwell-Nordstrom valves, *the seat is never exposed to corrosive or erosive line materials.* And at all times the plug is surrounded by a tough film of pressurized lubricant to provide:

- a protective coating between plug and body that prevents grinding wear, means longer valve life and easier operation.

- a far tighter seal than is possible with ordinary metal-to-metal closure. Holds lightest gases or heaviest fluids.

- lubricant, forced into a chamber at the small end of the plug, serves as a hydraulic jack, insuring continuous, dependable operation.

And Rockwell-Nordstrom simple quarter turn closure makes power, gear, or wrench operation two to five times faster than ordinary valves. Ideally suited for automation.

Genuine Rockwell-Nordstrom lubricants:

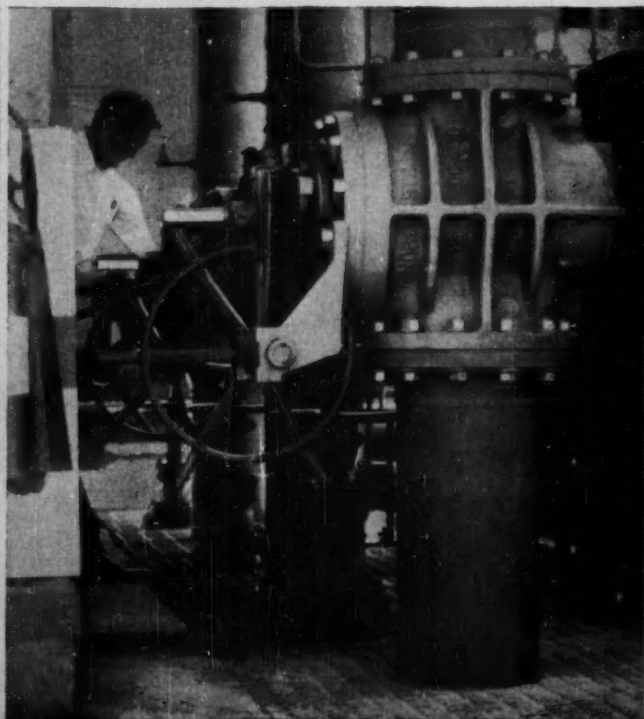
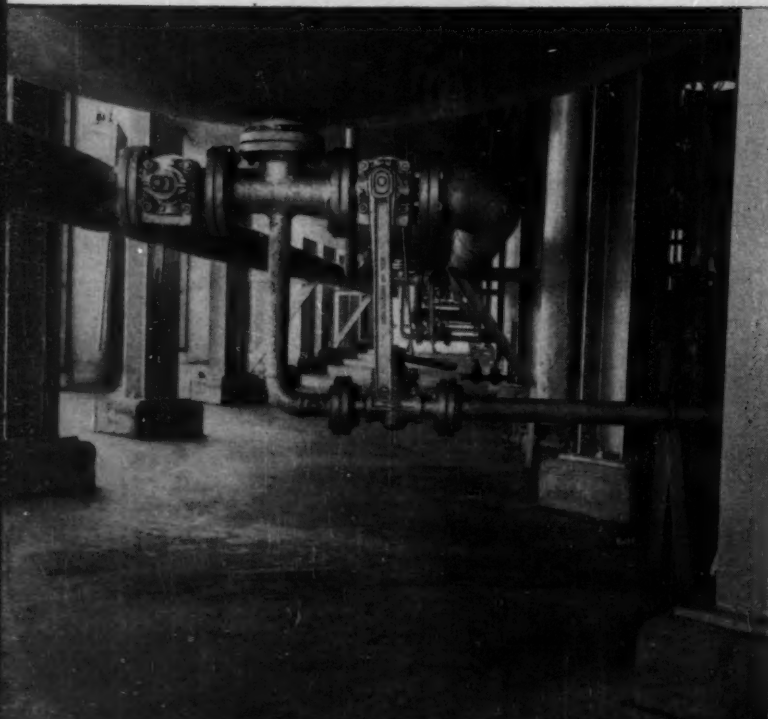
There are genuine Rockwell-Nordstrom lubricants to meet almost any combination of pressure, temperature and line fluid conditions. They are the result of the longest and most extensive research into valve lubricants ever made by any company. Their purpose is to help Rockwell-Nordstrom—the *original* lubricated plug valve—give you the best valve service you have ever had, *at the lowest yearly cost.*

What are your valve problems?

Rockwell-Nordstrom valves are made in a wide range of sizes, pressures, special metals and body designs for chemical and process applications. Your Rockwell-Nordstrom Sales Engineer can help you specify the right valve and lubricant combination for your needs. Or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa.

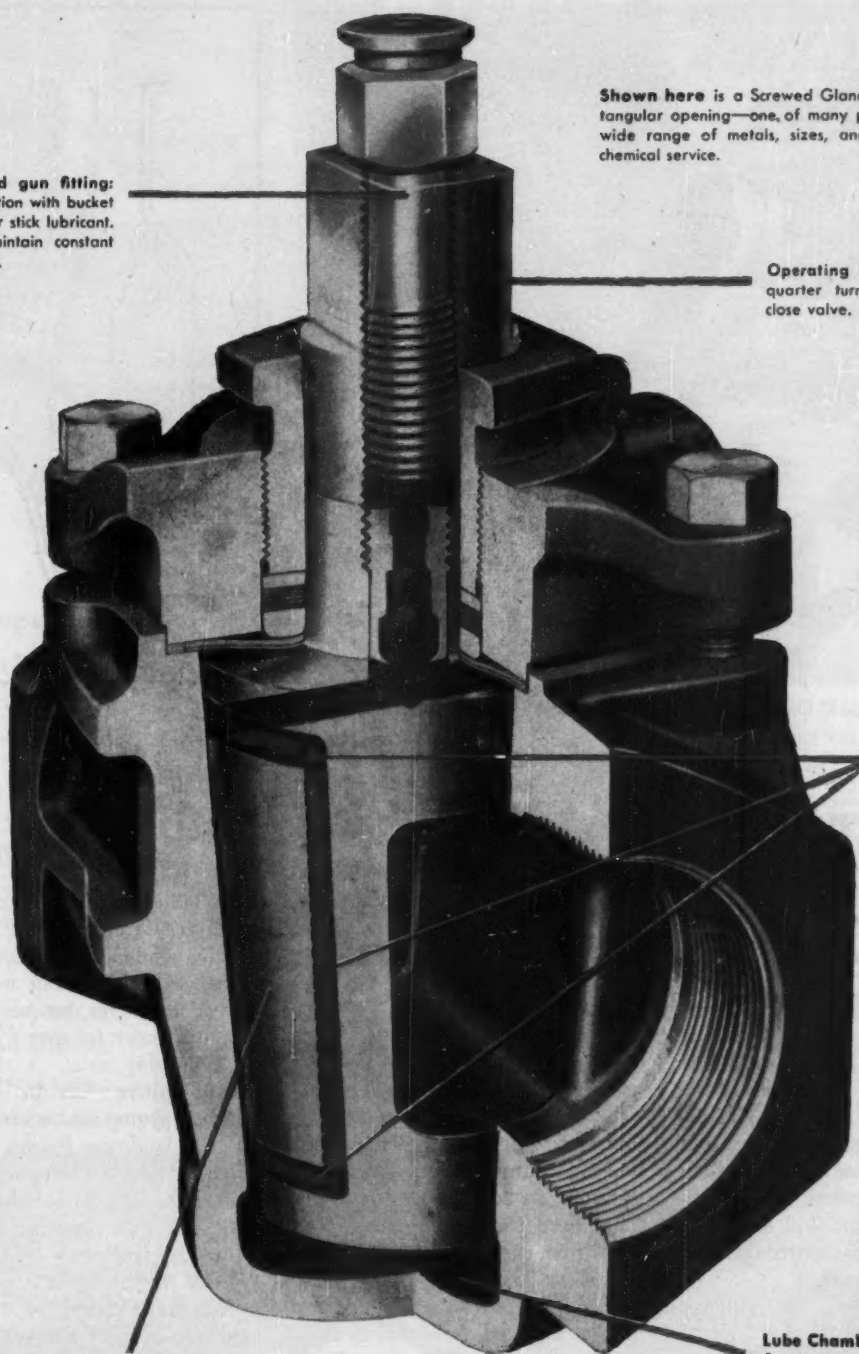
Wrench operated Rockwell-Nordstroms on these latex tank blow-down lines provide leak proof control under constant operation that would soon ruin ordinary valves.

These Rockwell-Nordstrom gear operated valves assure fast, dependable control on dry hydrogen supply lines at a big ammonia plant.



Lubricated Valves

Chemical Process Service



Lube Screw and gun fitting:
Easy, fast lubrication with bucket gun, hand gun, or stick lubricant. Check valves maintain constant lubricant pressure.

Shown here is a Screwed Gland steel valve with rectangular opening—one, of many patterns available in a wide range of metals, sizes, and pressure ratings for chemical service.

Operating Shank: Quick quarter turn to open or close valve.

Lube Channels: "Sealdport" lubricant system assures perfect seal. Lubricant eliminates metal-to-metal friction.

Tapered Plug: Maximum strength, positive seating, perfect sealing.

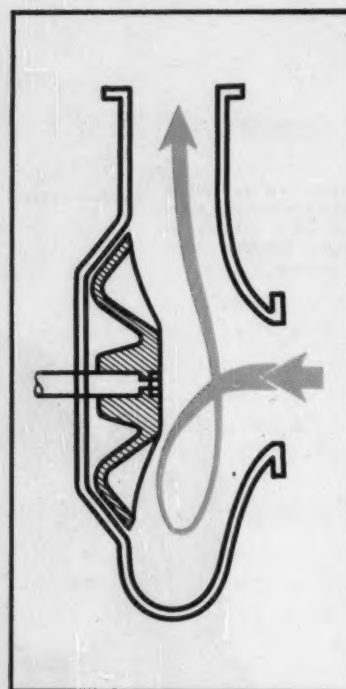
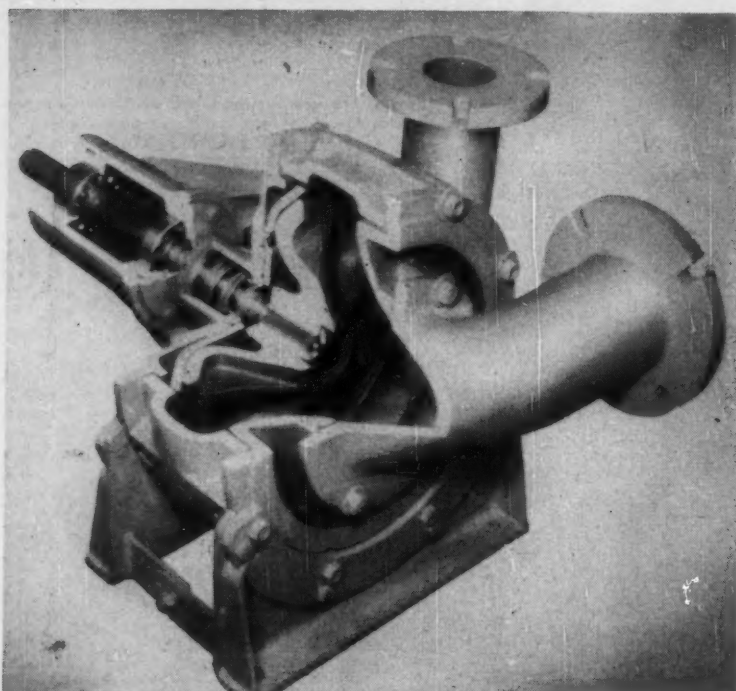
Lube Chamber: Jack plug for easy operation, if necessary. No stuck or galled valve down-time.

ROCKWELL-Nordstrom VALVES

LUBRICANT SEALED FOR POSITIVE SHUT-OFF



NEW FLUIDS HANDLING EQUIPMENT . . .



CHUNKS or abrasives, fibers or soft lumps are pumped without plugging, solids breakage or rapid wear because . . .

Impeller Is Out of Liquid Flow Path

Pipe-size flow passage and recessed impeller make this centrifugal, solids-pump a trouble-free, low-cost unit for moving trouble-making slurries.

Claiming to pump anything from live fish to ready-mixed concrete the new Wemco Torque-Flow solids pump recently entered the marketplace of slurry-handling equipment. It carries, as a pedigree, a basic patent said to be the first issued on any centrifugal-type pump in many years.

Here are some of the things it can do:

- Pump foods with little or no damage. Already it has replaced a mechanical conveyor moving cherries from receiving barrels to sorting tables. The fruit was unharmed and the pump operated

an entire season without maintenance.

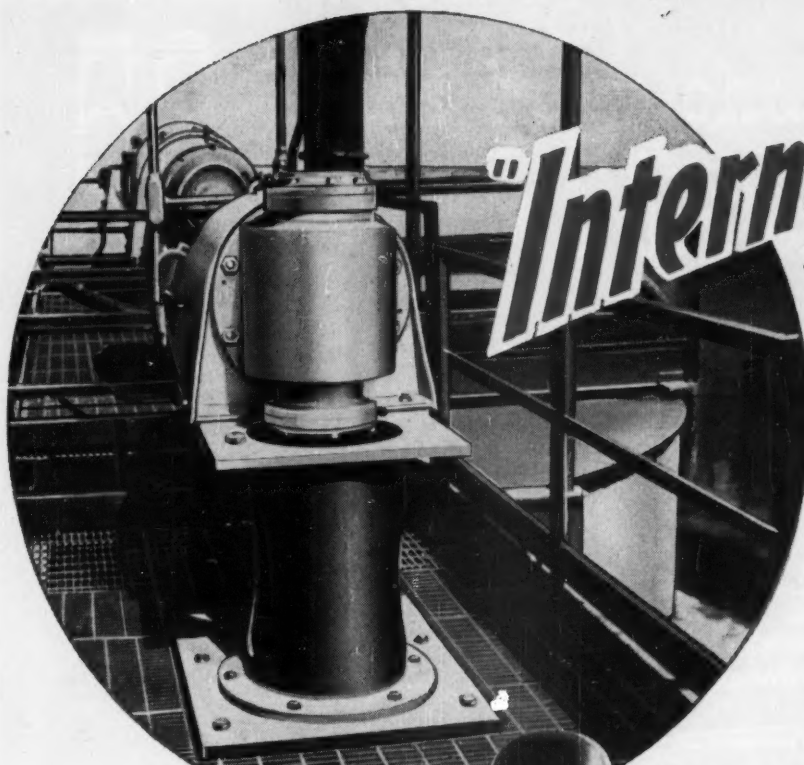
- Move abrasive ore slurries. In a lead-zinc ore processing plant previous pumps had a normal life of four days before becoming worn-out. Feed surges and tramp oversize frequently stopped flow altogether. The Torque-Flow pump passed all oversize that entered and even pumped abnormally-thick slurries produced by surges. Wear also was much less than for conventional design.

- Handle trash-loaded raw sewage sludge. In a county sewage-treatment plant conventional non-

clog pumps actually were plugging with rags several times a week. An early hand-made model of the Torque-Flow, without any of the later refinements, has been running on this sludge for over a year without plugging once.

► **Automotive Kin**—In describing the new pump its backers compare it to a fluid-type torque converter, such as used for automotive transmissions. It's a completely new principle for moving materials through pipelines.

The impeller is fully recessed in the pump casing so that it is entirely outside the path of flow from inlet to discharge. From this position the impeller creates a vortex effect, causing slurry in the unobstructed main body of the pump to rotate. And this movement develops suction and



"International" MIXERS *Tailored for the job—*

**But Basically Designed for
Contingent Modification**

After all, it's PERFORMANCE that counts. Engineers agree that efficiency comes first in profitable operation, and a Mixing unit designed for the purpose at hand (with adaptability to similar operations) will deliver superior performance and optimum results. INTERNATIONAL Mixing and Processing Equipment is preferred by Engineers because they know it is made and Guaranteed for a specific purpose—to do it better and at less cost. It's adaptability to other similar operations is an extra advantage to the user, where modification due to normal process changes become necessary. Motors, Gear Ratios, Shafts and Shaft Diameters as well as Turbine Elements are of course, interchangeable within normal limits, at minimum time and expense.

Wherever you find INTERNATIONAL Equipment you'll find a pleased user—and you'll find it in practically every segment of the Chemical, Pharmaceutical, Ceramic, Industrial and Petroleum industries. Remember to investigate "INTERNATIONAL" when you want Guaranteed Performance.

INTERNATIONAL ENGINEERING, INC. DAYTON 1, OHIO

New York • 15 Park Row • WOrth 2-2580
Chicago • 507 S. Dearborn • WABash 2-0723

TECHNICAL BULLETINS AVAILABLE

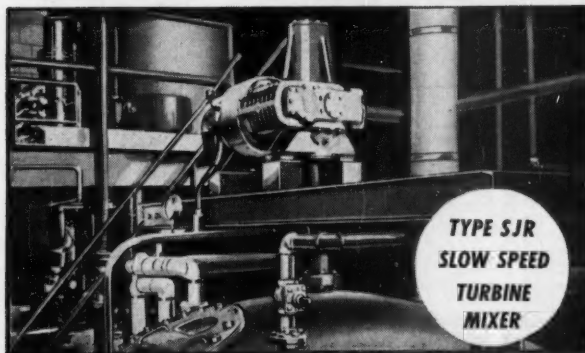
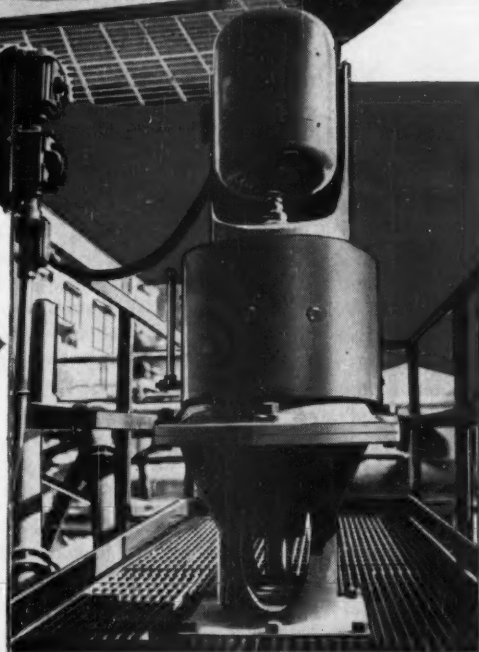
In the interest of intelligent Engineering Cooperation, INTERNATIONAL issues Technical Bulletins on the various phases of Mixing and Processing, which will be gladly sent on request. Simply indicate the subjects in which you are interested.

Top Entering Mixers and Agitators	73-76
Side Entering Mixers and Agitators	72-A
Dry Blenders and Ribbon Mixers	78
Grinding and Mulling Pans	5-A
Portable Mixers	74-A
Mixing and Extruding Machinery	62-A
Ball and Pebble Mills	100
Continuous Mixers	A
Stack Fans and Duct Boosters	109-A
Laboratory and Pilot Plant Equipment	77-A

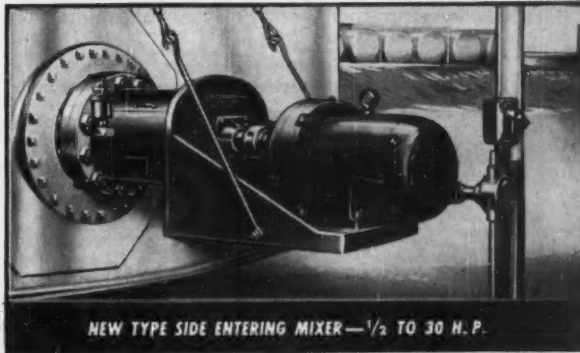
↑
Type LFR
"INTERNATIONAL"
Slow Speed
Turbine Type
Mixer

→ Type GFR
"INTERNATIONAL"
Slow Speed
Turbine Type
Mixer

Courtesy of
International Minerals
& Chemical Corp.,
Bartow, Fla.



TYPE SJR
SLOW SPEED
TURBINE
MIXER



NEW TYPE SIDE ENTERING MIXER—1/2 TO 30 H.P.

Equipment on these pages made news this month . . .

Equipment Cost Index, p. 238

Page number is also Reader Service code number

New Fluids Handling Equipment

Solids-Handling Pump	236A
Diaphragm Valve	238A
Jacketed Elbow	238B
Turbine Scrubber	240A
Polyethylene Fittings	242A
Chemical Pump	242B
Dust Collector	242C
PVC Valves	242D

Motor Base	246C
Enclosed Motor	246D
Chemical Motor	246E

New Packaging & Handling Equipment

Drum Inserts	248A
Sectional Conveyor	248B
Tractor Shovel	248C
Polyethylene Package	248D
Screw Conveyor	248E

New Electrical & Mechanical Equipment

Improved Motor Insulation	244A
Truck Battery	244B
D.C. Motor	244C
Electrical Conduit	244D
Circuit Breaker	244E
Mechanical Seal	246A
Low Speed Motor	246B

New Instruments & Controls

Electronic Screen	250A
Viscometer	250B
Aerosol Sampler	250C
Strip-Chart Recorder	252A
Telemeter System	252B
Load-Cell Control	252C

. . . For more details, use Reader Service Card

pressure heads necessary for pumping.

The rotating fluid mass forms a buffer between the impeller and most of the suspended solid particles and chunks passing through the pump. Flow through impeller vanes such as experienced with conventional centrifugal pumps has been eliminated in the Torque-Flow design.

For this reason solids suspended in the fluid are not battered by the rapidly revolving impeller vanes. There is little if any degradation of the solids. Abrasion of the vanes is a small fraction of that encountered generally with centrifugal pumps.

►What You Can Get—Torque-Flow pumps are being built in sizes from 2 to 10 in. for flows up to 3,900 gpm. at 80 ft. head. Pumps can be furnished with mechanical seals and can be built in a choice of materials including Ni-Hard or other abrasion-resistant steels, stainless steel, bronze and other special alloys.

Among the mechanical features are provisions for rapid disassembly, complete or partial, from either end without disturbing piping. There are no wear rings or necessity for lateral adjustment of impeller shaft to compensate for wear. Bearings are heavy-duty, anti-friction and there is optional

choice of mechanical seals.—Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. 236A

Saunders patent diaphragm valves are now made with bodies of P.V.C. or Uscolite styrene copolymer. In the first instance sizes run from ½ to 2 in.; in the second up to 3 in.—Hills-McCanna Co., 3025 North Western Ave., Chicago 18, Ill. 238A

Jacketed elbow with extra long radius is new welding fitting available in sizes from ¼ to 8 in. Suited for viscous materials. Red Jacket Co., Inc., Investment Bldg., Pittsburgh 22, Pa. 238B

EQUIPMENT COSTS



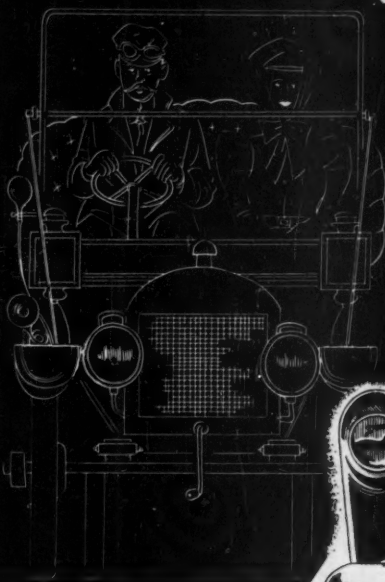
	June 1954	Sept. 1954
Process Industries		
Cement mfg.	178.0	177.3
Chemical	186.6	185.9
Clay products	172.8	172.1
Glass mfg.	176.4	175.7
Paint mfg.	179.7	179.0
Paper mfg.	180.0	179.3
Petroleum ind.	183.2	182.5
Rubber ind.	185.6	184.9
Process ind. avg. .	183.7	183.0

	Related Industries	
Elec. power equip. .	188.5	187.7
Mining, milling ...	187.6	186.8
Refrigerating	205.3	204.5
Steam power	175.9	175.2

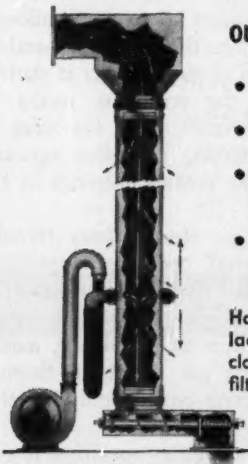
Compiled quarterly by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. See *Chem. Eng.*, Nov. 1947, pp. 124-6 for method of obtaining index numbers; March 1954, pp. 214-6 for annual averages since 1913.

50

Years have changed a lot of things!



...including DUST CONTROL



Licensed by H. J. Hersey, Jr.

Diagram of operating
design of filter tube.
(Available in multiples of 4, 8, 12,
16 and 32 tubes)

OUTSTANDING DAY REVERSE JET FILTER ADVANTAGES

- 99.99+-% Filtering Efficiency
- Up to 5 Times Higher Filtering Rates
- 100 per cent of Equipment Investment Is in Operation at All Times
- Smaller Size with Higher Capacity Saves Valuable Plant Space

Handles 5 times more dust laden air per square foot of cloth than conventional dust filters.

The automobile has changed America's living habits and the DAY High Pressure Reverse Jet Filter has changed American industries' dust control methods. To match the challenge of changing times and changing needs DAY leadership revolutionized the control of dust by utilizing the Hersey principle of filter cloth cleaning with HIGH PRESSURE REVERSE JET AIR. This advanced type of filter handles FIVE TIMES MORE DUST LADEN AIR per square foot of filter cloth than conventional filters. This is the most important improvement in dust filtering in 50 years.

Modern manufacturing methods demand modern dust control methods. There is nothing that will match the high on-the-job efficiency provided by DAY filters. It is a proven fact that one DAY filter recommends another. DAY High Pressure Reverse Jet filtering has been used by leading companies for more than 5 years. 87% of DAY filter users have ordered additional DAY Reverse Jet Filters. For maximum filtering results from a minimum filter investment write for complete facts. DAY gives you tremendous savings in valuable plant space, installation and maintenance costs.

Write to DAY for FREE Bulletin 528-R, about
America's most advanced dust filter.



The DAY Company

856 Third Ave. N. E. • Minneapolis, Minnesota
IN CANADA: P.O. Box 70N, Ft. William, Ontario
Branch Plants: Buffalo, Ft. Worth and Toronto, Ontario
Representatives in Principal Cities



AIR POLLUTION with DAY DUST CONTROL

Water Cone Cleans Air or Gas Effluent

It thoroughly wets and holds air or gas-borne particles giving a clean plant effluent. As a gas-liquid contactor it offers a high degree of intimate contact.

Are you in a running feud with the official smoke watcher for your community? If so, you'd do well to investigate the Turbine Scrubber. It's claimed sure-fire in knocking down air-borne pollutants emanating from plants.

Because it can contact gas and liquid intimately it shows promise for process work as well. And the scrubber can be built either in single or multi-stage for both cleaning and contacting jobs.

► **Built Large or Small**—With major industrial centers in the news for smog conditions the public thinks that large plants are prime contributors to air pollution. It's true that huge operations may throw many thousands of cfm. of contaminated air or gas into the atmosphere. But the most annoying and troublesome processing effluents many times are those under 5,000 to 10,000 cfm.

An outstanding advantage of the Turbine Scrubber is that it can be tailored to fit the needs of both large and small-volume requirements. It can handle small volume jobs economically, displacing apparatus that, in many cases, is wholly inadequate. As such, it is a new tool for scrubbing flows under 10,000 cfm.

► **Clear Discharge**—True elimination of particles entrained in air or gas streams is possible if the particles are wet successfully and held within the wetting media, according to technicians in this field. By doing just this the Turbine Scrubber eliminates water-insoluble dust or finely-divided particulate matter.

If the entrained pollutant is water soluble it can be recovered in a chemical solution or oil. Or it can be dissolved in the scrubbing water, then precipitated or recovered through evaporation.

In some cases, where finely-suspended solids are difficult to wet, an additive is used to ensure thorough wetting and trapping of the solids. In others, where finely divided fibrous material or lint is present the unit has proven able to operate continuously without plugging.

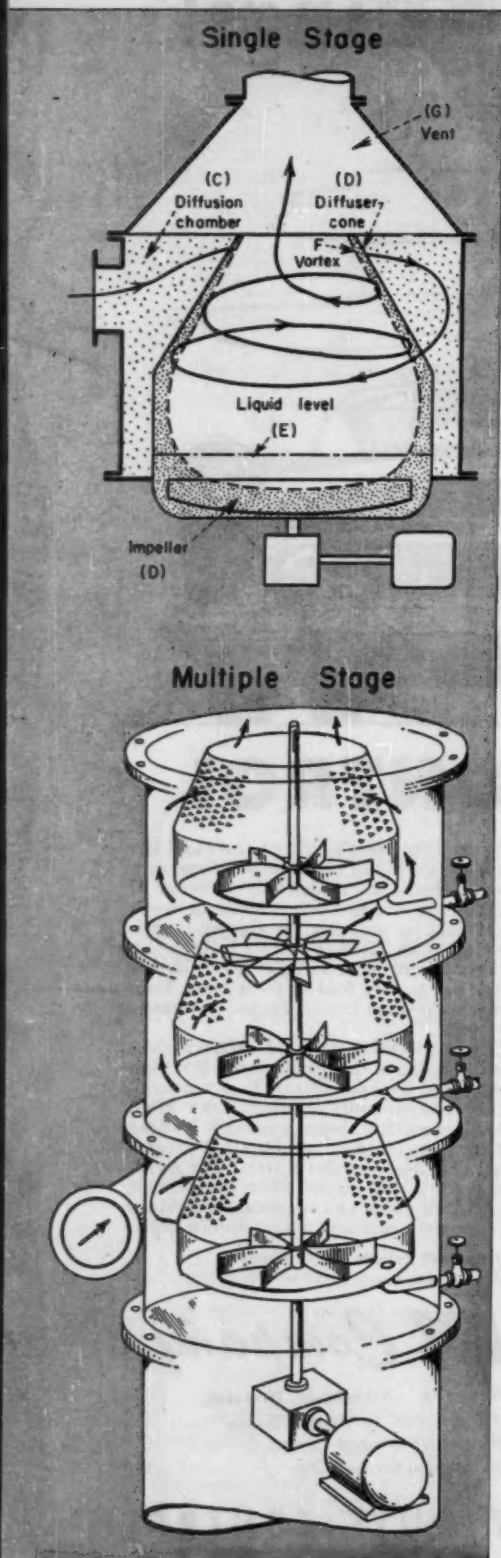
► **Basic Components**—You will note in the sketch that the scrubber has a kettle-like base that contains a bottom-driven, turbine-impeller, D. Above the base is a diffuser cone, B, having tangential, venturi-shaped perforations. The assembled base and cone are mounted within a diffusion chamber, C, with the opening of the cone discharging into the vent, G.

► **Trapped by Vortex**—To operate the Turbine Scrubber, water or other scrubbing media is introduced into vessel, A, until it reaches the level, E. Then the contaminated air or gas is allowed to flow into the diffusion chamber. Rotation of the impeller is started, forcing the scrubbing media to form a vortex along the sides of the chamber, extending up and across the venturi openings in the cone.


The gas stream flows through the venturi openings tangentially into the revolving vortex. Entrained particles are wetted and held within the scrubbing media, while the gas passes on through the rotating curtain and is ejected through the vent.

Success of the operation is governed by rotational speed of the impeller, shape and design of the venturi openings in the cone and by the balance established between the incoming air stream and the centrifugal effect of the rotating vortex.

Feed into the unit is propelled by positive pressure. The amount



THINGS TO COME...WITH
Glycerine

...to make soup: add one **EDIBLE**  **PACKET** to hot water...packet and all

Just imagine soup concentrate in a packet that's soluble, odorless, tasteless, nontoxic.

Think of other package uses: Powdered soap or detergents,
sugar, puddings and desserts, pharmaceuticals.

—or any product added to water in fixed amounts.

They're all possible with new edible films
that are derived from Glycerine or using Glycerine as a plasticizer.

The unique balance of properties that won such wide acceptance for Glycerine
in the past continues to open new doors to chemical progress. In paints, foods,
pharmaceuticals, packaging . . . for tomorrow's surge of new specialties . . .
in formulations and reactions yet unknown. Nothing takes the place of Glycerine.

This balanced group of properties keeps

Glycerine's

usefulness growing

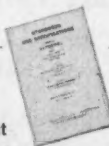
HYGROSCOPICITY • STABILITY •
SOLVENT POWER • VISCOSITY • NONVOLATILITY •
NONTOXICITY • TASTE • MW/HYDROXYL RATIO •

HUMECTANT •
CARRIER • SOLVENT • LUBRICANT • SOFTENER •
EMOLLIENT • ANTI-FREEZE • ALKYD BASE •

☒ CHECK AND SEND FOR TECHNICAL DATA



☐ 20-page booklet on
Glycerine for product
conditioning



☐ 12-page booklet on
Glycerine standards
and specifications



☐ 16-page booklet on
Glycerine properties
and applications

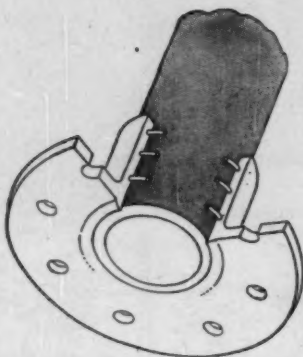
For your free copy of any or all of these booklets write: GLYCERINE PRODUCERS' ASSOCIATION • 295 Madison Ave., New York 17, N. Y.

NEW FLUIDS HANDLING EQUIPMENT . . .

of scrubbing media required is very small. For a unit handling 2,500 cfm. it will be roughly 40 gal. Energy to maintain the vortex will average 2.4 bhp. on a unit this size. Blower drive for the gas should be 3 hp.

On most operations loss of liquid from the scrubber is largely due to evaporation. For heavy entrainment load the scrubbing media must be bled off continually for clarification or replacement with fresh liquid.

Multi-stage units can operate with different scrubbing media in each stage. In this manner the scrubber is very effective as a gas-liquid contactor for process application.—Pollution Control Corp., 66 Elm St., Westfield, N. J. 240A



Flanges and Fittings

For polyethylene pipe contain element for welding by induction heating.

A positive seal and easy installation are claimed for a recently introduced series of flanges and couplings for polyethylene and fluorocarbon pipe. An ingenious combination of induction heating components fuses fitting and pipe into a solid unit eliminating need for flame welding.

As shown above, the flange is fitted with small wire rings which act as heating elements where the fitting joins the pipe. A small portable 200-w. induction heating unit is clamped around the neck of the fitting. Heat induced in the wire rings melts the plastic surrounding the wire and within seconds fuses the two pieces into a solid unit.

Fittings grooved but without

rings can be used with Tenite pipe to give a stronger joint with adhesive than is customarily possible. Whereas, conventional fittings tend to wipe away the adhesive film when joined with the pipe, the grooves on the new type act as glue reservoirs assuring a good film.—Columbia Basin Plastics Co., 1900 S. W. Harbor Dr., Portland, Ore. 242A

Chemical Pump

Designed for longer life and easier maintenance and inspection.

Featuring design wrinkles based on a special industry survey, a new line of pumps is engineered specifically to handle acids and corrosive chemicals. Most of the incorporated features requested by industry contribute to longer operating life, easier inspection and maintenance.

For example, the complete pump rotating element, bracket and stuffingbox assembly can be removed as a unit without disturbing the piping. All parts are interchangeable, with the exception of the pump case and impeller.

For protection against corrosion there is a resistant catch basin as an integral part of the pump case. Pump bearings have triple protection and there is a molded synthetic rubber snap-on gland cover to guard against acid spray.

Pumps are built either in corrosion-resistant alloy 20 or cast iron for general service. If desired, a mechanical seal can be furnished. Four basic sizes with various motor and impeller combinations cover a capacity range from 20 to 400 gpm.—Byron Jackson Co., Pump Div., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. 242B

Dust Collector

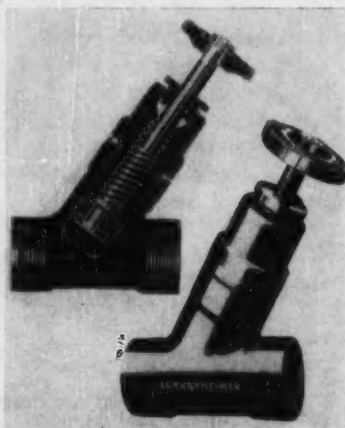
Reverses tangential flow to gain high efficiency.

Tangential flow that is normal for most centrifugal dust collectors is reversed by an outside-in twist in

the Amerclone dry granular dust collector. It traps fly ash and dust.

Effectiveness depends upon a conical inlet that imparts a swirling motion to dust particles while permitting clean air to travel through without changing direction.

Nine Amerclone tubes are combined in a standard modular cell. Nominal rating is 3,000 cfm with a face area of only 20 by 20 in. Any number of cells may be combined to reach required capacity within limitations of space. Actually, each tube can handle double or triple the throughput of conventional units of comparable size, thereby saving space.—American Air Filter Co., Inc., Louisville 8, Ky. 242C



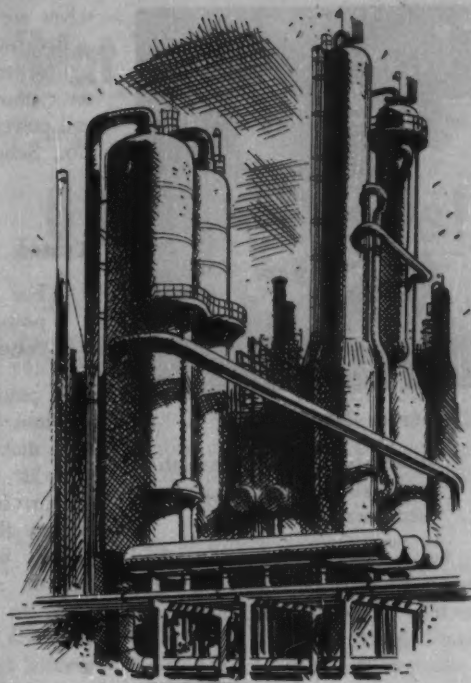
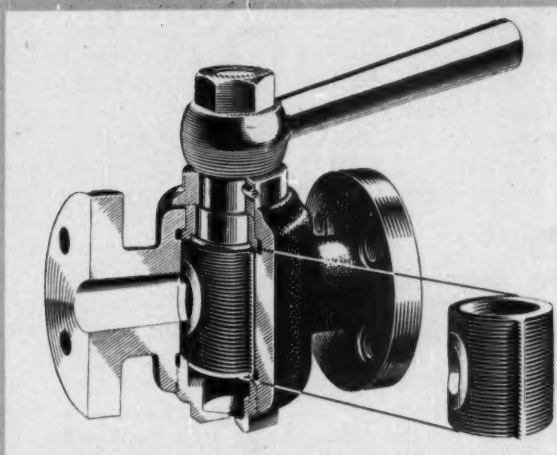
Valves and Fittings

Molded of PVC will cost less than those made of stainless or other alloys.

The newly launched Luncor line of valves and fittings is claimed the first with all-molded construction. The exclusive molding process gives the PVC material exceptional strength, protects its natural corrosion-resistance and substantially lowers cost.

Molded in rigid form of PVC the Y-type globe valve is suitable for 125 psi. and 150 C. And it will be priced lower than stainless steel and other alloy valves.

Fittings include caps, couplings, plugs, unions, reducing bushings, flanges, 45 and 90 deg. elbows, and tees.—Lunkenheimer Co., Cincinnati 14, Ohio. 242D



Tightness tells with the Klinger sleeve-packed cock!

In the last quarter of a century Klinger Sleeve-Packed Cocks have steadily replaced the old-fashioned asbestos-packed cocks with their limitations of working pressure, difficulty of repacking, and tendency to jam. They are available in a wide range of designs

and sizes for all purposes and pressures and with the following outstanding advantages:—

Renewable "Klingerit" Packing Sleeves. Parallel-ground and non-jamming plug. Can be retightened during operation. Unobstructed straight-thru full bore.

Write for the Klinger Master Catalog, which describes the complete range of Klinger products, compressed asbestos sheet jointings and packings for every purpose, seatless piston valves, sleeve-packed cocks, reflex and thru-vision level indicators and rings and seals in natural, synthetic and silicone rubbers and other synthetic materials.



RICHARD KLINGER LIMITED, KLINGERIT WORKS, SIDCUP, KENT, ENGLAND

Manufacturing Licensees for Canada:

JOSEPH ROBB & COMPANY, LIMITED
5575 COTE ST. PAUL ROAD, MONTREAL, 20, CANADA
Telephone: WILBANK 3181 Cable: ROBCO

Branches at: SYDNEY, HALIFAX, OTTAWA, TORONTO, HAMILTON
WINNIPEG, EDMONTON, VANCOUVER, QUEBEC CITY

Agents throughout the World

Manufacturing Licensees for U.S.A.

THE KLINGER CORPORATION OF AMERICA
95 RIVER STREET, HOBOKEN, NEW JERSEY, U.S.A.
Telephone: HOBOKEN 2-7915 Cable: KLINGDALE

DISTRIBUTORS OR AGENTS IN PRINCIPAL CITIES



Electric Motors

Now boast new insulating materials that greatly improve performance.

Two new insulating developments for electric motors are expected to boost performance to new heights.

A new thin-film heat-resistant wire insulation will raise the limiting temperature for long motor life from 220 to at least 300 F. Using Alkanex-insulated wire, motor horsepower can be increased without increasing motor size. Motors once rated at 20 hp. may be upgraded to 25 hp. or more.

So tough is the Alkanex insulation that coated wire has been pounded flat without breaking the film. And Alkanex-insulated wires have been baked at 300 F. for more than six months without any signs of deterioration or loss of insulating strength.

The second development announced recently is a completely new coil insulation with 50% longer life than conventional systems. It is now becoming available on induction motors of 100 to 3,000 hp. rating. With 50% greater dielectric strength and 600% more mechanical strength it is hailed by its makers as the most significant development in form-wound insulation in 50 years.

Dacron tape, Mylar polyester films and a synthetic hydrocarbon resin are combined to form the homogeneous Polyex insulating structure. It's a system where all the materials are natural insulators. Previous systems were based on cotton or paper, which in them-

selves are not insulating materials.

Because Polyex insulation is tighter and more homogeneous it tests (above) substantially lower for coil power factor.—General Electric Co., Schenectady, N. Y. 244A

Truck Battery

For lift trucks gives more power in same space as predecessor.

A power boost of 25% over a previous model is claimed for a new nickel-iron battery for industrial lift trucks. While measuring 24 in. higher than the type C battery the New MC battery will usually fit into the same battery box on existing trucks.

As an example of the increase in power, the MC 30-cell unit has a rated capacity of 20.52 kwhr. as against the older 30-cell C-8 unit capacity rating of only 16.20 kwhr.

The battery can be charged at its normal rate or at an average of its normal rate throughout. It has no finish-rate limitations and no discharge limits. It is not injured by accidents such as reverse-charging or short-circuiting. It can be laid up indefinitely without injury.—Edison Storage Battery Div., Thomas A. Edison, Inc., West Orange, N. J. 244B

D. C. Motor

Accelerates faster, gives more torque in less time.

To keep pace with the forward-striding field of automatic control Reliance has introduced the new Super T line of d.c. electric motors. Response to control is faster and more accurate than ever offered before in a standard-design motor. On many applications they are reported twice as effective as other motors now produced.

Acceleration of the Super T to full speed is twice as fast as was previously possible. To achieve this, mechanical and electrical inertia have been lowered and commutating ability increased.

In describing the new motor Reliance engineers say it has Dynamic Response—the controlled reaction to demand for a change; dynamic to control heavy loads rapidly, yet gentle to give finely controlled power to extreme accuracy.

Super T motors come at present in sizes from 20 to 100 hp. Ratings both above and below this range also will be built in the future. A complete range of mechanical enclosures protects the motors under any operating conditions.—Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio. 244C

Electrical Conduit

Has long life under severe corrosive conditions present in chemical plants.

Long life under severely corrosive atmospheric conditions is claimed for the new heavy-duty, rigid, electrical conduit, Superduct. Claims are backed by extensive tests conducted by the independent Pittsburgh Testing Laboratory.

Superduct is galvanized by the Sherardizing process, a method that gives a uniform zinc coating and positive bonding. Then it is coated inside and out with a special vinyl chloride copolymer enamel that is pigmented and plasticized.—National Electric Products Corp., Gateway Center, Pittsburgh, Pa. 244D

Circuit Breaker

In 400-amp. rating saves cost and space on many jobs.

A new 400-amp.-frame molded case circuit breaker bridges the gap between a 225-amp.-frame breaker

For More Information . . .



about any item in this department, circle its code number on the Reader Service

Postcard inside the back cover.

If your heat transfer system
goes up to 600°F....



SOCONY-VACUUM

*process
products*



SOCONY-VACUUM

Heat Transfer Oil 600 **offers you** **6 Big Advantages!**

If your heat transfer requirements go up to 600°F., you'll find that S/V Heat Transfer Oil 600 is by far the *best* medium you can use! S/V Heat Transfer Oil 600 is not just another oil originally intended as a lubricant; it was *specially developed* as a heat transfer medium—the *only* product in the 600°F. range with *all* these advantages:

1. *Gives years of trouble-free performance.* It's stable—won't deteriorate—costs you far less in the long run because it lasts longer.
2. *It's safer* because its flash point remains *constant*. Won't crack at high temperatures... there's no boil-off loss—no vapor lock.
3. *Assures lower maintenance costs* because it's non-corrosive. This means longer life for all parts of your system—fewer replacements.
4. *Eliminates worker complaints*—there's no objectionable odor.
5. *Eliminates downtime for clean-outs.* Won't form carbon or sludge deposits—heat transfer efficiency remains high.
6. *You save on power consumption* because it's free-flowing. You get easy, fast starts even at low temperatures.

Remember, too, that expert technical service goes with S/V Heat Transfer Oil 600 to help you improve your production—cut costs. Call your Socony-Vacuum man today for full details.

SOCONY-VACUUM OIL CO., INC., 26 Broadway, New York 4, N. Y.,
and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

SEND FOR THIS TECHNICAL BULLETIN

Socony-Vacuum Oil Company, Inc.
26 Broadway, New York 4, N. Y.

Gentlemen:
Please send me your bulletin, "S/V Heat Transfer Oils."

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

NEW ELECTRICAL & MECHANICAL EQUIPMENT . . .

and a 600-amp. model. It will take over duties previously handled by the larger more expensive 600-amp. breaker on circuits carrying 225 to 400 amp. It can be used in panelboards, switchboards, motor controls, bus duct plugs and individual enclosures.

This KL unit is a thermal-magnetic circuit breaker with quick-make, quick-break operating mechanism. Interchangeable trip units provide continuous rating versatility from 125 to 400 amp.

Measuring 9 in. wide, 15½ in. high and 5½ in. deep the KL breaker is more than one third smaller than the 600-amp. frame breaker. It's available in ratings from 125 to 400 amp., either two or three pole; 600-v. a.c. or 250-v. d.c., 25,000 amp. maximum interrupting capacity.—**ITE Circuit Breaker Co.**, 19th and Hamilton St., Philadelphia 30, Pa. 244E

Mechanical Seal

For high-pressure sealing of rotary shafts.

Type P. T. rotary mechanical seal is designed to retain process fluids under high pressure. Suitable for temperatures from minus 80 to plus 400 F. it operates against pressures from 50 to 600 psi.

Seal can be fabricated from selected metal alloys for handling all kinds of fluids except molten alkali metals and some fluorine compounds at the higher temperatures. For mounting the type P. T. Dura Seal rotary unit a cut-down shaft or stub sleeve is required. Packing space should be ¼ in. or larger.—**Durametallic Corp.**, 2104 Factory St., Kalamazoo, Mich. 246A

Low Speed Motor

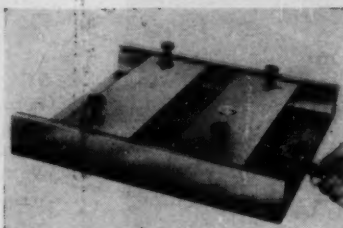
Can produce rotary motion within sealed pressurized system.

Developed for nuclear power plants but of possible interest to chemical engineers are two new motors. They produce low speed rotary motion that is variable in

speed and direction, has positive torque and accurate positioning ability at zero speed.

Announced recently before the AIEE by W. E. McCown of Westinghouse Electric Corp. these motors can operate immersed in high temperature fluid at 2,000 psi. They can produce torque of 8 lb.-ft. with a speed of 0 to 50 rpm.

While these motors and their specially designed control systems are relatively expensive they are basically simple in design. They have given reliable performance over extended periods of time.—**Westinghouse Electric Corp.**, Pittsburgh, Pa. 246B



Motor Base

Permits quick, easy adjustment of center distances for variable speed drives.

Here's a time saver for users of variable pitch sheaves. By releasing the adjusting screw you can slide the motor after the base is bolted down. Screw then is replaced in slotted boss for final take-up.

This base was designed for motors fitted with wide-range, variable-pitch sheaves. Such drives require more take-up than standard V-drives to accommodate belt stretch and changes in pitch diameter.—**T. B. Wood's Sons Co.**, Chambersburg, Pa. 246C

Enclosed Motor

Provides wound-rotor service in hazardous atmospheres.

If you need a motor with low starting current, high starting torque, smooth acceleration, jogging or variable adjustable speed

and you have to run it where it's moist, dirty, corrosive or hazardous then you'll welcome news of this new wound rotor motor. It's believed to be the first rib-type, enclosed, fan-cooled wound-rotor motor to be made with slip rings, brushing rigging, rotor and stator all mounted inside a single frame enclosure.

The frame of the motor has an extended front end to include the slip rings, brushes and brush rigging within one enclosure. Two large pipe plugs can be removed from the upper quadrant of the frame to provide two large openings for maintenance work and adjustment of brushes and brush rigging.

NEMA standards for horsepower and speed relationship to frame size have never been established for enclosed, wound-rotor motors. These motors are built on NEMA frames with standardized mounting dimensions, yet they may be on a different frame than a cage motor with similar rating.—**Allis-Chalmers Mfg. Co.**, General Machinery Div., Milwaukee 1, Wis. 246D

Chemical Motor

Is totally enclosed and protected from damaging corrosive atmospheres.

Just announced is a motor developed just for the dangerous and damaging atmospheres encountered in chemical service. Designated types SD and SE this chemical motor is produced in ratings from 3 to 150 hp.

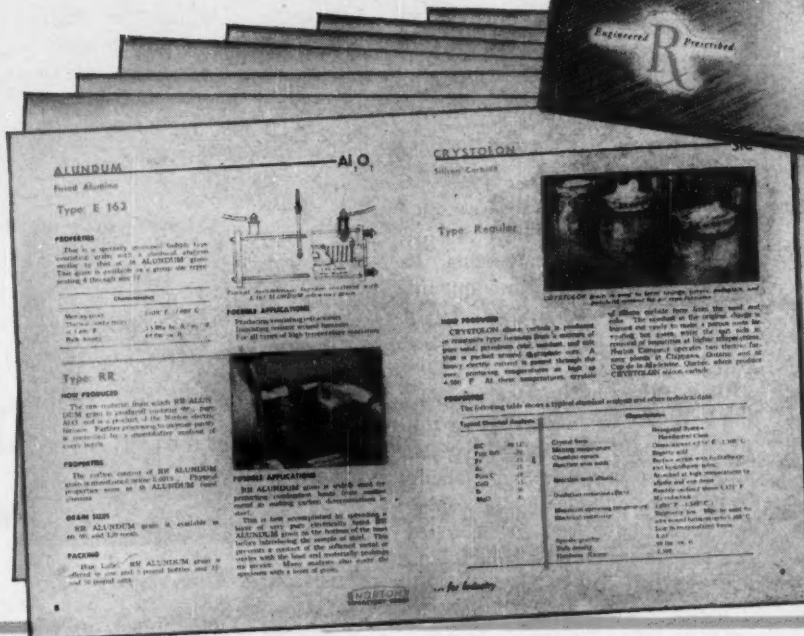
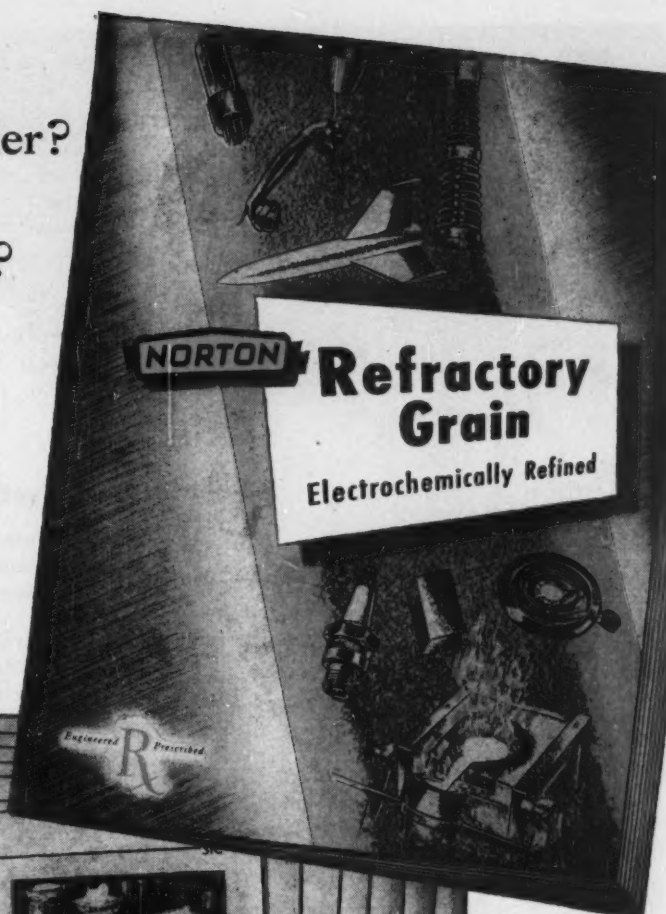
Among its special features: a stainless-steel stator band surrounding the inner enclosed case, a stainless-steel fan cover guard, cast-iron conduit box sealed with a non-deteriorating impervious compound, cast-iron ventilating fan for the totally-enclosed design or a cast bronze fan for explosion-proof service with Underwriters' Label, cadmium plated screws and fittings exposed to the atmosphere, elongated bearing caps and a double-sealed moisture drain.—**U. S. Electrical Motors Inc.**, Box 2058 Los Angeles 54, Calif. 246E

• *Stymied by a
High-Temperature Barrier?*

• *Looking for a
High-Purity Material?*

• *Searching for a
material with
Unusual Electrical
Characteristics?*

*You may find the answer in
this new booklet on
NORTON Refractory Grain*



This latest Norton publication is 8½" x 11". Twenty-four pages, with many charts, tables and photographs in color. A wealth of practical information on the nature, performance and application of refractory grains.

If you're concerned with industrial processing involving temperatures ranging upwards to 4000°C. and materials to contain your inferno — if you're looking for a high-purity material such as high-purity fused alumina for coating electronic heater filaments — if you're searching for a material with unusual electrical characteristics such as E 179 CRYSTOLON® Silicon Carbide for lightning arrestors — one of the many types of Norton Refractory Grain available may solve your problem.

This new booklet describes in detail Norton Refractory Grain — produced and purified in electric arc and high temperature resistance furnaces — which is helping industry to improve existing products and

processes and to create new ones.

• It's a valuable reference book with up-to-the-minute information on the chemical and physical characteristics of such materials as CRYSTOLON® Silicon Carbide, ALUNDUM® Aluminum Oxide, MAGNORITE® Magnesium Oxide, Fused Zirconia and Boron Carbide. In it you'll find data on how these materials are produced; their behavior under varying conditions; available grain size and applications.

These electrochemically refined materials may be just what you've been looking for to solve your problem. Write today for your free copy of "Norton Refractory Grain." NORTON COMPANY, Refractories Division, 501 New Bond Street, Worcester 6, Mass.

NORTON
REFRACTORIES
Engineered... R... Prescribed

*Making better products...
to make your products better*

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



Drum Inserts

Made of rubber transform steel drums into corrosion-proof containers.

Removable rubber drum inserts now are available for standard 55-gal. drums. Use of these Drumserts will permit any standard 55-gal. drum or barrel to hold acids and other corrosive materials.

Drumserts are preformed, independent linings made of neoprene or sheet rubber. To install, the rubber insert is merely set in the drum. The lip provided on the insert is lapped over the top of the drum and pulled taut. This enables the Drumsert to grip the drum and maintain a stationary position, regardless of handling.

Drumsert rubber inserts can be removed from drums in a matter of seconds by merely peeling the lip that laps over the sides of the drum.

Along with these new rubber inserts, rubber snap-on lids also can be provided.—Automotive Rubber Co., Inc., 12550 Beech Rd. at P.M.R.R., Detroit 39, Mich. 248A

Sectional Conveyor

Is heavy duty unit for conveying bags.

The new Saco sectional bag conveyor is a heavy-duty unit for handling bags, boxes and cartons. It is built in 18- or 24-in. widths with standard 20-ft. interlocking sections. Designed for horizontal

conveying, the units can be adapted for portable or inclined conveying.

Drive units are equipped with tail-shaft-mounted sprocket for transmitting power to the driven units. Motor-reducer drive is mounted under the conveyor frame on steel deck.

Maximum capacity of unit is 200 lb. per lineal ft.—Stephens-Adamson Mfg. Co., Aurora, Ill.

248B

Tractor Shovel

Combines torque converter and new transmission to gain improved performance.

An improved Payloader, model HFC, rear-wheel drive tractor-shovel combines the features of a new special transmission with a torque-converter drive. Improved performance, decreased maintenance and longer life are among the gains realized.

The torque converter is a self-cooled, three-element type that automatically multiplies torque output of the engine in direct proportion to the load requirements. It substantially reduces the amount of gear-shifting required as well as concentration and effort on the part of the driver.

The full-reversing transmission has four speeds both forward and reverse, up to 28 mph. All parts are made so precisely that they are completely interchangeable. No longer is there need for matched sets of parts.—Frank G. Hough Co., 754 Seventh St., Libertyville, Ill.

248C

Polyethylene Package

Made by extrusion, increases packaging output and lowers cost.

A completely new type of polyethylene package, made by an extrusion technique, permits filling through large base openings for greatly increased packaging rates. Bracon collapsible tubes and squeeze-to-use bottles are used for those powders, liquids or semi-solids that are packageable in poly-

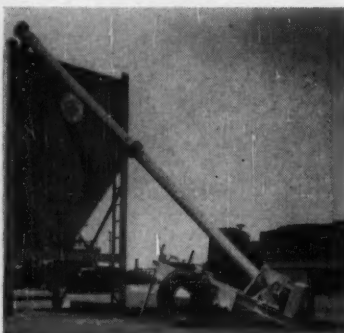
ethylene. They combine the functional aspects of the squeeze bottle with the lower costs of metal tubes, while overcoming many of the drawbacks of both.

Bottoms of bottles are sealed with polyethylene disks which are fused by radiant heat and welded to the walls. Tube bottoms are fused under radiant heat and crimped tightly by cooled jaws.

Bracon containers can be furnished printed in multi-color. Also they can be made to control dispensing action, as desired. Stock tubes hold from $\frac{1}{8}$ to 16 oz. with diameters ranging from $\frac{3}{8}$ to $2\frac{1}{2}$ in. and a choice of three wall thicknesses. Bottle capacities range from $\frac{1}{8}$ to 16 oz. with diameters from $\frac{1}{2}$ to $2\frac{1}{2}$ in.

In conjunction with the new package a 2-million-volt electron beam sterilizer is being used to sterilize both package and contents. It is done at room temperature.—Bradley Container Corp., Maynard, Mass.

248D



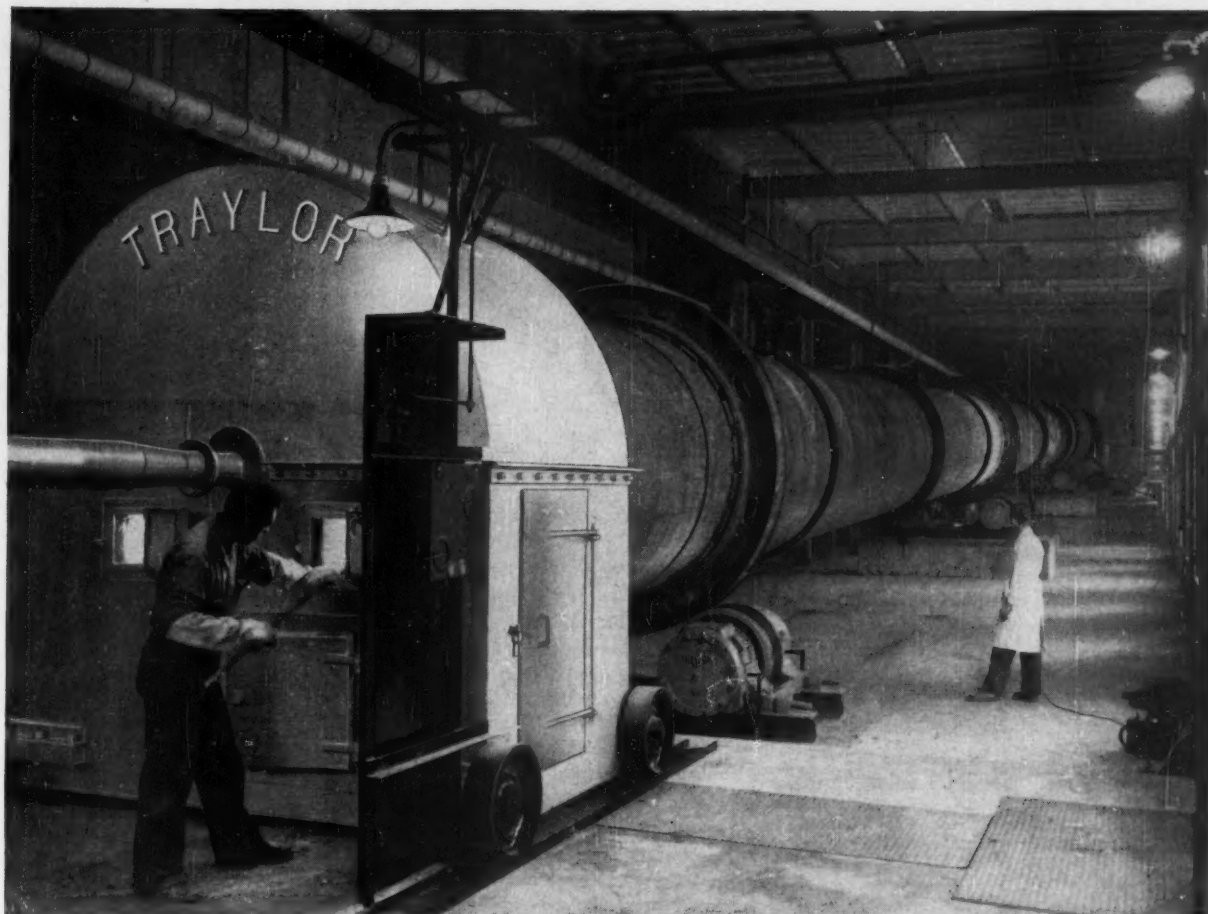
Portable Conveyor

Loads at 60-ton per hr. rate, adjusts hydraulically.

Granular solids can be transferred between levels from 6 to 16 ft. using a new portable two-screw conveyor. Tagged the Delta Bazooka it can be moved behind an auto or light truck.

Screw is driven by a two-cylinder engine equipped with a self starter, clutch and gear-reduction unit. Angle of elevation is controlled hydraulically. A short cross screw feeds the longer elevating screw.—Delta Tank Mfg. Co., Baton Rouge, La.

248E



the Personal Touch of a Traylor Engineer

WILL PAY DIVIDENDS IN YOUR ROTARY KILN OPERATION

A Traylor engineer makes it his business to keep in touch with every Traylor Rotary Kiln. His periodic visits usually result in a better product, reduced operating costs, or increased production with your Traylor Kiln.

"Keeping in touch" is routine at Traylor. That's why so many of the world's leading Chemical processors return time after time for additional "Traylor-made" kilns to handle their thermo-processing requirements. Get in touch with Traylor if you need advice on profitable Rotary Kiln operation.

TRAYLOR ENGINEERING & MFG. CO.

711 Mill St., Allentown, Pa.

Canadian Mfrs.: Canadian Vickers, Ltd., Montreal, P. Q.

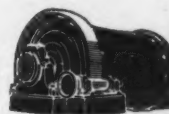


PRIMARY
GYRATORY CRUSHERS



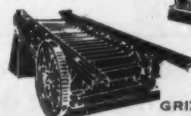
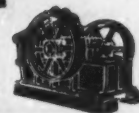
ROTARY KILNS,
COOLERS, SLAKERS

SECONDARY
GYRATORY CRUSHERS



GRINDING MILLS

JAW CRUSHERS



APRON AND
GRIZZLEY FEEDERS

SEND FOR BULLETINS
... just mention the Traylor
Equipment that interests you.

SALES OFFICES • NEW YORK • CHICAGO • SAN FRANCISCO

CHEMICAL ENGINEERING—February 1955

249



Electronic Screen

Places before your eyes results from giant calculator.

Visual results soon will be available from giant calculating machines. Cathode ray tubes will present data in the form of graphs, geometrical figures, engineering symbols, words or numbers. A permanent record is furnished through use of a 35-mm. pulse-operated camera that takes pictures from tube.

The type 740 cathode-ray-tube output recorder is designed for use with type 701 and 704 electronic data processing machines. It includes a 21-in. cathode-ray tube for immediate visual display and inspection of data being computed by the 701 or the 704; and a 7-in. tube operating in conjunction with a 35-mm. camera as a recording unit.

By the use of appropriate instructions or programming techniques in the computer, all the cathode-ray-tube displays and operations of the camera are completely automatic and under the control of the computer.—International Business Machines Corp., 590 Madison Ave., New York 22, N. Y. 250A

For More Information . . .



about any item in this department, circle its code number on the Reader Service

Postcard inside the back cover.

From the Rostrum

. . . On the Automatic Plant

"The continuous plant of the chemical industry is the typical automatic plant of today. . . . In these plants, instruments strive to hold conditions as set by human operators . . . in line with their knowledge and experience.

The automatic plant of tomorrow will feature greater use of computing machines to select control settings in process equipment. . . . Combined with automatic instrument setting, this will give plants greater safety, greater productivity and better products."—Dr. Thomas J. Walsh, 4th Semi-Annual Meeting and Winter Conference, Manufacturing Chemists Association, Inc., New York, N. Y.

. . . More on Push Buttons

"While there are still many insurmountable technical and economic problems to solve before the fully automatic push-button plant leaves the dream stage, there are many sub-

stantial economic gains to be had by intelligent application of existing instrumentation technology.

Before such gains can be realized the following conditions and facilities must be provided:

1. Top management must recognize the importance of the automation program as a means to maintain its competitive position.

2. Top management must insist that the operating divisions develop programs properly to exploit instrumentation techniques.

3. Facilities must be provided for training of both technical and non-technical personnel to cope with the new problems arising from use of the more complex instrumentation.

It is possible to start such a program on a modest scale and to have the program expand on a pay-as-you-go basis."—V. F. Hanson, 4th Semi-Annual Meeting and Winter Conference, Manufacturing Chemist's Association, New York, N. Y.

Viscometer

Relates time and temperature to thixotropy, dilatancy and yield value.

A new rotational viscometer is constructed to give accurate results on industrial applications for long periods of time. Standard models cover a range from 0.2 to 3,000,000 centipoises.

A synchronous motor and spindle axle are both mounted inside a torque-reactive housing (dynamometer) which can rotate freely within 350 deg. As the spindle rotates at constant speed, the resistance or viscosity is transmitted to the dynamometer.

A precision, constant-modulus spring opposes movement of the dynamometer. Attached to the dynamometer is a pointer that instantly indicates deflection in either direction against a stationary and completely visible dial.

Instrument can be operated manually, or adapted for automatic process control. It can provide

automatic proportional or integral regulation of viscosity. Through connection to a recorder, process can be regulated with compensation for temperature effects.—Drage Products, 406 32nd St., Union City, N. J. 250B

Aerosol Sampler

Completely collects dust particles, smoke, fumes, fogs and mists.

Weighing less than 5 lb. and sampling up to 50 cc. per min. the Konisampler is a high-efficiency collecting device for particulate matter. Designed for aerosol investigations where great accuracy is required, it also is effective on other less exacting applications. It is said to be the only compact device of its kind on the market.

Laden air or gas is drawn between hot surfaces and a relatively cooler one. Particulate matter is deposited quantitatively on the cooler surface, which is a glass



**STYLE N
ROLLER
MILL**

3-STAGE GRINDING

***prevents
excessive
shattering***

THE ALLIS-CHALMERS three stage roller mill increases yield by minimizing fines. Each progressively finer grinding is extremely gentle. There is no excessive shattering . . . no size-destroying impact. Granulations are uniform. The entire mill output is ready for further processing. Elimination of fines reduces costly reprocessing.

To meet the varying requirements of the

chemical industry, Allis-Chalmers roller mills are also made in one pair and two pair high. All are of the single-flow type. Two and three pair high mills are used when no separation is necessary between reductions. Roller mills are available with rolls of 9 and 10 inch diameters in 18 to 42 inch lengths. For complete information, see your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wis.

A-4214



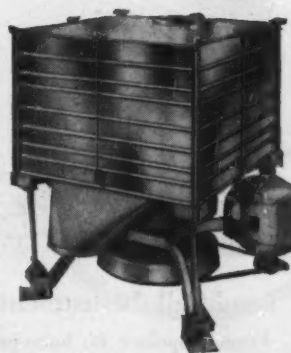
FLAKING MILL

Pre-mill flaking is one of the many adaptations of Allis-Chalmers equipment and engineering in the chemical industry. By compacting your mill feed into broad surfaced flakes, the Allis-Chalmers flaking mill speeds subsequent grinding operations *two to four* times. Flakes shatter easier than other forms of material.

CIRCLE SIFTER

By utilizing stacked decks, the *Circle* sifter utilizes gyratory motion to provide the screen area of a single deck-type screen requiring *four times* the floor space. Flexible capacity, quick product changeover and positive tensioning are other advantages.

Circle is an Allis-Chalmers trademark.



ALLIS-CHALMERS

Reduction and Separation Equipment



NEW INSTRUMENTS & CONTROLS . . .

slide. It can be examined visually, optically, gravimetrically, chemically, spectrographically or with an electron microscope.

Instrument will operate from 110-v., 60 cycle current or a 6 or 12-v. storage battery together with an inverter for converting back to 110 v.—Joseph B. Ficklen, 3rd, 1848 East Mountain St., Pasadena 7, Calif. 250C

Strip-Chart Recorder

Uses new amplifier to increase reliability and ease maintenance.

In the new Marksman potentiometer, strip-chart recorder there are no vacuum tubes. Amplification is done entirely by high performance magnetic amplifiers.

By using this new-type amplifier the recorder has been made re-

sistant to vibration. It can be mounted on or near machinery, yet give years of trouble-free service.

There are fewer moving parts; wear has been reduced to a minimum. And operation is not affected by lead length variations.

There are six chart speeds—changed by moving a lever. Chart can be wound on take-up roll or removed daily without chart waste.

—West Instrument Corp., 525 North Noble St., Chicago 22, Ill. 252A

Telemeter System

For flow, temperature and pressure is not affected by varying signal level.

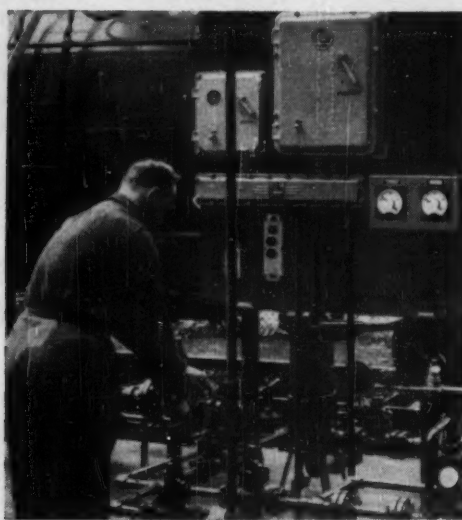
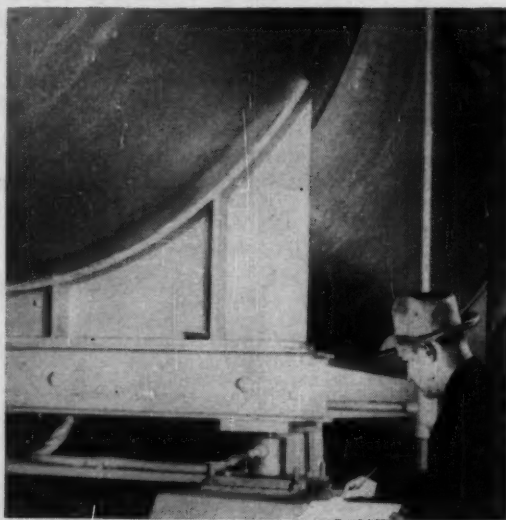
Based on the principle of impulse duration, a new telemeter system can tolerate wide variations

in signal level without impairing operation or accuracy.

System consists of a transmitter, a receiver and a power pack to furnish electrical energy for transmitting the signal. Duration of the signal transmitted every 12 sec. is proportional to the variable being measured by conventional elements. Automatic synchronization keeps transmitter and receiver accurately co-ordinated.

Signals can be transmitted over a single pair of leased wires, private wires, radio link or microwave system. Using standard relays and without repeating stations, signals can be transmitted 50 miles over standard telephone wire. A special relay can boost this to 150 miles.

The Teletax system has relatively few moving parts, does not include any vacuum tubes.—The Foxboro Co., Foxboro, Mass. 252B

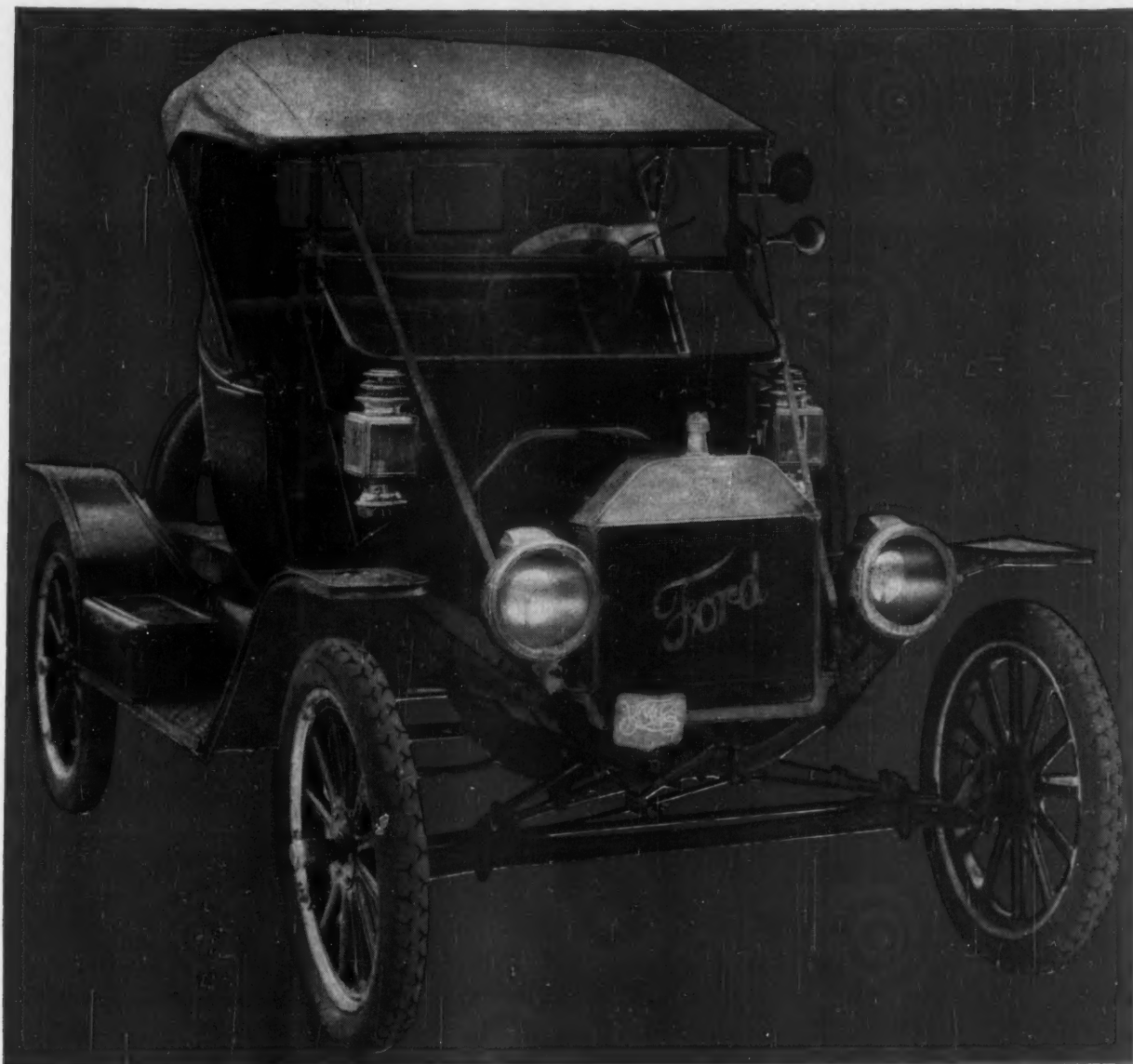


Load-Cell Instruments Control Handling of Liquefied Gas

Freon propellant for home-product dispensers now is handled from tank car to storage to packaging line with minimum evaporation and leakage losses. Normally a vapor at atmospheric pressure and temperature, Freon must be pressurized to hold it in the liquid state. And under such

conditions large amounts can be lost unless there is close inventory control. Two small SR-4 compression-type load cells under each of two 15,000 gal. storage tanks keep a close check on supply. Two low-cost PTL weight indicators on the pump control board report storage inven-

tory during unloading of tankcar. Pump stops automatically when tank contains 13,500 gal. Strip-chart recorders back of filling line show rate of consumption that may run up to 5,000 lb. per hr.—Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa. 252C



PROVED PERFORMER

This handsome little Ford runabout has had a well-cared-for life. Now, almost fifty years old, its engine purrs, its paint and brass gleam as though it were a youngster just off the assembly line.

Dependable quality that has stood the test of time is a point of pride in Esso Petroleum Solvents, too. Our production facilities and laboratories have been in the business for a long time, during which product quality has been developed to an amazingly high level. Find out for yourself, next time you order. Specify Esso Solvents — famous for their dependable high quality and performance.

You can depend on Esso Solvents for

MULTI-STORAGE AVAILABILITY — water terminals in industrial centers.

MODERN HANDLING METHODS — separate tank storage, pumping lines, tank cars and trucks are used in all handling operations. Prompt delivery to your door is assured.

SOLVENCY — Esso aliphatics and Solvesso aromatics cover both high and low solvency ranges.

CONTROLLED EVAPORATION — available in a wide range of evaporation rates with precise characteristics to meet your most exacting requirements.

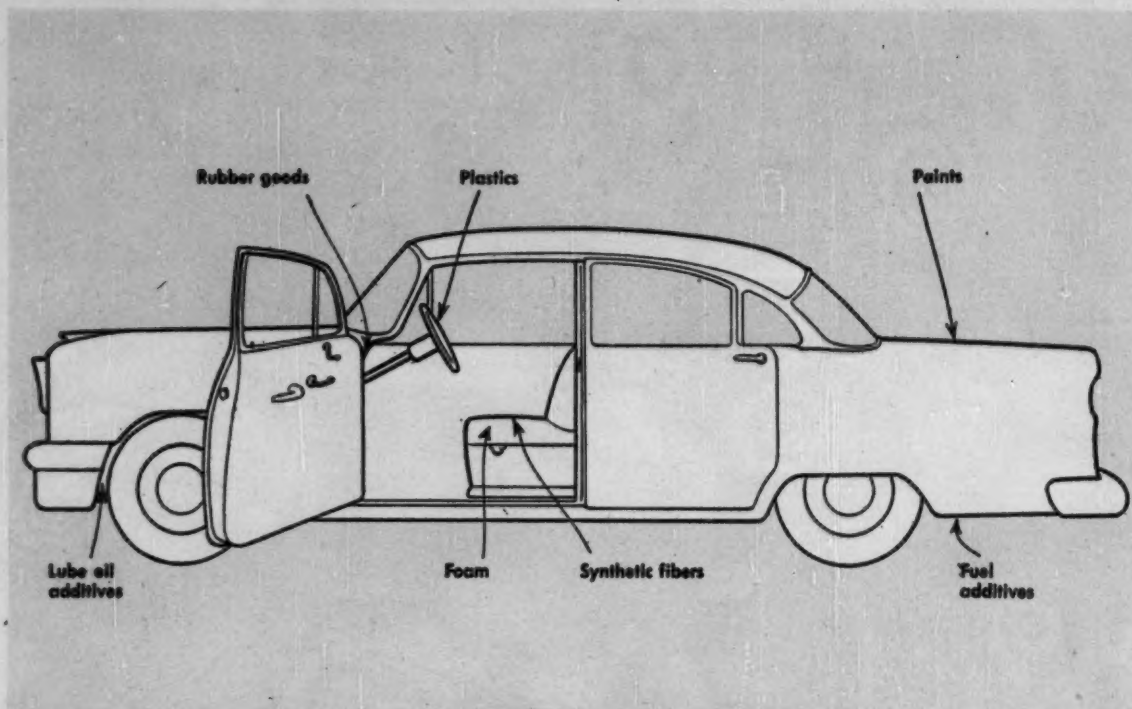
FOR TECHNICAL ASSISTANCE — If you have a solvents problem or want further information on the specifications and characteristics of Esso Solvents—write or call our office nearest you. Our technicians will be glad to assist you.



PETROLEUM SOLVENTS

SOLD IN: Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY
Boston, Mass. — Pelham, N. Y. — Elizabeth, N. J. — Bala-Cynwyd, Pa. — Baltimore, Md. — Richmond, Va. — Charlotte, N. C. — Columbia, S. C. — Memphis, Tenn. — New Orleans, La.



DELUXE OR STANDARD, America's cars and trucks are prime markets for a growing host of chemicals.

From Fibers to Foams, Chemicals Make Cars

Now, as never before, the automotive industry depends on chemicals for both sales appeal and vital parts. For many firms it's a field well worth exploiting.

"The chemical industry deserves a good share of the credit for helping to make America's 1955-model passenger cars the most attractive and colorful in history."

This pat on our backs by Chrysler vice president Abram vander Zee summed up what a lot of people said recently at a Chemical Market Research Assn. meeting in Detroit. But though kudos to chemicals were the order of the day, intermingled in the praises were challenges to the ingenuity of our chemists and engineers. Many potential outlets for chemicals in cars are just opening up.

► **Trim Could Be Big**—Most dramatic possibilities probably lie in the plastics field. Right now the average car uses about 4 lb. of thermoplastic materials, $\frac{3}{4}$ lb. of thermosettings. These require over 28 million lb. a year of basic chemicals—cresols, aldehydes, anhydrides, vinyl alcohol and the like. And, says J. K. Totten of Ford, "there is a tremendous potential for increased use of plastics as interior trim in automobile bodies."

But will it be exploited?

The auto industry hopes so, but is unlikely to take the initiative. Consumption of plastics in cars is

static and unless steps are taken by outside industries to supply cheaper materials and better fabricating and molding machinery, the only expected boost will come via larger, rather than more, parts.

As for the future of reinforced plastics as structural members, Mr. Totten is pessimistic. Processing techniques are primitive, he says; material cost is high and labor requirements relatively great. For units of 25,000 or less he thinks there may be some advantage for reinforced plastics. But above that the advantage probably dissipates quickly.

► **Rubber Goods Climbing**—More certain for the near future are the prospects of elastic and rubber materials used for such things as engine supports, seals, hoses and weatherstripping. According to

One of many advantages of 90/10 Cupro-Nickel **WELDABILITY**



Welding head on filter shell

One of the relatively new copper base alloys is 90/10 Cupro-Nickel, which is coming into increased use as a result of experience with it. Revere offers it in sheet and plate, pipe and tube. It is highly resistant to corrosion and erosion, particularly in salt or brackish water. In addition it can be cold or hot worked, welded, soldered and polished. Because its nickel content is less than the older 70/30 alloy, it is priced lower.

The item shown here is a 90/10 Cupro-Nickel filter for aviation gasoline, designed and fabricated by the Warner Lewis Company, Division of Fram Corporation, Tulsa, Oklahoma, for the U. S. Navy. Heads and shell are $1\frac{1}{8}$ " thick. Revere was given the opportunity to collaborate with the Warner Lewis manufacturers on welding, which was successfully accomplished by the metallic arc process, using Inco 70/30 Cupro-Nickel electrodes. The vertical weld on the shell was X-rayed 100% and found satisfactory to pass Navy inspection. Because of the thickness of the metal, it was decided to form the heads hot at around 1690° F. The forming was done by the Hackney Iron & Steel Co., Enid, Okla., which also consulted with Revere.

Warner Lewis Company of Tulsa, with representatives in 30 cities, are specializing on all types of alloy design and fabrication and inquiries of this nature are invited.

If you wish information regarding the selection, welding, or working of copper and its alloys and aluminum alloys, see the nearest Revere Sales Office.



Completed aviation gasoline filter,
made of 90/10 Cupro-Nickel

REVERE
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N.Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.;
Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—
Sales Offices in Principal Cities, Distributors Everywhere.

James O'Reilly, also of Ford, 1930 models used 175 such items weighing 33 lb.* In 1950 this had shot up to 540 items weighing 100 lb. and costing over \$60. And there's no reason why this trend shouldn't continue.

Just what materials will go into these applications in the years ahead is a big question mark. Right now, of course, synthetic and natural rubber are the most important by far, with relative percentages varying as the price of natural rubber fluctuates. But, says Mr. O'Reilly, more expensive materials can be justified if they allow consolidation with fewer parts and less assembly labor. The success of silicones and nylon moldings show that high price is not an insurmountable hurdle.

There will undoubtedly be many surprises in this field—for example, the rather abrupt switch to tubeless tires as standard equipment, which few foresaw a couple of years ago.

► **Joy for Nylon**—The upholstery maker has definitely turned to synthetic fibers—to the immense benefit of nylon and rayon consumption. Edwin Grajeck of Collins & Aikman Corp. estimates that over 2.5 million lb. of nylon went into automotive fabrics in 1954. Assuming a minimum of 5 million cars made last year, and figuring on only six yards of upholstery fabric used in each, at least 30 million lb. of total fabric were used.

Nylon and nylon-rayon blends are becoming standard because

nylon most nearly meets auto requirements. Many others have been tried in recent years but just didn't measure up. Fibers like Dynel and Saran are too heat sensitive; Dacron and Orlon are too hard to dye; others lacked luster or produced very streaky fabrics.

Not that nylon's perfect by any means. For one thing it's expensive. So in lower priced cars standard upholstery is often wholly or partly made of acetate or viscose.

Looking ahead, Mr. Grajeck points out that polymers, including organo-silicon polymers, are potential finishes for upholstery fabric. These might impart such functional qualities as abrasion and soil resistance, and waterproofness.

► **New Paints Needed**—Per vehicle consumption of paints is not likely to change much from its present level of 7 gal.—4 gal. body paint, 3 gal. for specialized uses. With 8 million total automotive units annually, this is a healthy 56 million gal. market.

But new resins are coming out all the time, some of them likely to displace present products.

In body paints, Melvin Gerson of Ford predicts continuing use of nitrocellulose lacquers and alkyd enamels as top coats, with molecular modifications for better chip resistance and higher gloss. Epoxy resins, though, cross-linked with polyamides, look particularly attractive. And if some way can be found to minimize overspray they may well become the next automotive paint resin, supplanting alkyds and nitrocellulose.

In primer coats, too, the epoxies are stirring up a lot of interest because of their excellent adhesion to many substances. However, two main faults will have to be licked. Spraying is difficult; and the resins have a tendency to cure to such an extent that most other paint vehicles won't adhere to them.

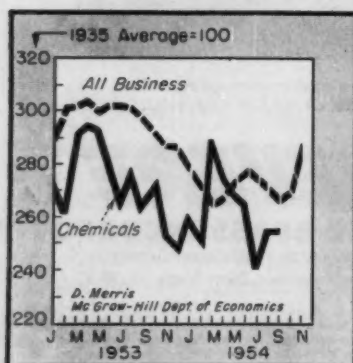
► **Big Foam Market**—In 1950 the auto industry used almost 50% of all the latex foam rubber made in this country—90 million lb. By 1953 this had jumped to 160 million lb., though dollar volume actually dropped from \$150 million to \$125 million due to the price drop in natural rubber.

Most of this foam, says T. H. Rogers of Goodyear, goes into seat cushions. Main reasons for the dominance of latex in this field are low cost, ease of fabrication and superior cushioning performance. The only serious rivals to latex foam in sight are the polyurethanes. These materials, still in their infancy in the U. S., have outstanding fire resistance, plus high compression at low density, which could possibly offset high cost.

The only other important elastomeric foam for cars is vinyl. But because of its poor cushioning performance, it's very likely to be limited to such applications as arm rests and dash board crash panels.

► **Better Performance**—Though not actually used on cars, gasoline additives are vital to the auto industry and consequently form a big market for chemicals. Consumption of tetraethyl lead alone, says R. K. Scales of Ethyl Corp., is 400-450

CONSUMPTION INDEX



Business Activity (Nov.) 287.7

Chemical Consumption Sept. (Prelim.) . . . 274.6

Aug. (Rev.) 254.9

Indexes	Oct.	Sept.	Paint & varnish . . .	25.85	27.64
Fertilizer	60.23	51.18	Textiles	10.46	9.54
Pulp & paper	33.81	30.87	Coal products	10.40	9.47
Petroleum refining . .	27.56	27.07	Leather	3.90	3.78
Iron & steel	14.13	12.49	Explosives	8.49	8.60
Rayon	27.88	25.14	Rubber	6.41	5.91
Glass	24.69	22.58	Plastics	20.76	20.64



The Pay Off!

Strange things frequently happen inside industrial stacks! Buell specialists can tell you, for they've spent the past twenty years finding out!

That's why so many of America's Leading Corporations depend on Buell knowledge and experience for the *recovery of valuable industrial dusts*. They know, for example, that Buell maintains a modern laboratory devoted to the analysis of industrial dust. They know that Buell provides three separate systems of industrial dust recovery. They know that the Buell Cyclone combines simple design with high efficiency . . . low maintenance. They know that the famous Buell Spiralectrode is setting dust collection efficiency records in the Buell 'SF' Electric Precipitator.

Why take risks? Let Buell Engineers help resolve your dust collection problems. They can forecast results in advance . . . before you spend a single penny!

Get the complete facts about *all three* Buell Systems of Industrial Dust Recovery. Write for your free copy of "The Collection and Recovery of Industrial Dusts". Dept. 12-B, 70 Pine Street, New York 5, New York.

buell



20 Years of Engineered Efficiency in
DUST RECOVERY SYSTEMS

million lb. a year (valued at \$250 million).

The amounts of additive per gallon of gasoline are nearly infinitesimal. But total gasoline consumption is so great that the total volume of additives used is substantial. For instance, to combat preignition losses and spark plug fouling only 0.02% of such products as Shell's TCP and Ethyl's chloropropyl thionophosphate are added. Yet the total market, according to Mr. Scales, is 8 million lb. a year, worth \$3 million.

Some of the other important fuel additives are surface active agents for rust inhibiting (10-50 ppm., 5 million lb. a year, \$1 million); antioxidants (2-16 lb. per 1,000 bbl., 6 million lb., \$7 million); alcohols to prevent freezing of water in gas tanks, pumps, etc. (28 million gal., \$10 million).

There's plenty of room for improved additives. Mr. Scales calls for one that "will either prevent combustion chamber deposits from accumulating or which will so modify them that they do not act as knock inducers. It would enable automobile manufacturers to go to substantially higher compression ratio engines without the necessity of a corresponding increase in the octane number of gasolines."

► **Lube Oils, Too**—Another big chemical outlet is in lubricant additives. Esso's E. F. H. Pennekamp estimates that about 400 million lb. of chemicals were used in 1953 to make over 250 million lb. of active lube oil additives.

Currently over 90% of crankcase oils sold contain substantial quantities of additives. In the last five years there's been a 250% jump in the value of additives (20-25% chemicals in oil carrier)—from \$39 million in 1948 to \$108 million in 1953.

Biggest single group of additives is detergents and inhibitors, which accounts for 66% of the dollar market and incorporates 170 million lb. of chemicals. Next in importance are viscosity index improvers—10% of the market, 22 million lb. Look for a big jump in VI improvers, too, because of popularity of multi-range oils.



Odor Chasers: Potent Tots

Small stream of essential oils makes possible
a \$20 billion torrent of salable products.

William H. Chartener, McGraw-Hill Dept. of Economics

Odor is a tiny business as chemicals go. Yet no other segment of the chemical industry of comparable size has a better right to the obvious pun on its name than "essential" oils.

The industry, producer of basic odorants, does an annual volume of less than \$100 million. A half-dozen firms, operating mostly in New York City, employing about 2,000, account for the bulk of this business.

But despite this puny volume, one trade estimate puts the annual value of products using essential oils conservatively at \$20 billion—200 times the value of the oils themselves. Many of these products could not be made—at any rate could not be sold—in their present form without the odors provided

by essential oils. In other products the oils are valuable ingredients for a variety of reasons.

► **For Romance**—Perfume is the clearest example of a product that couldn't exist without odor. Related products comprising the entire cosmetic field owe a substantial part of their appeal to fragrance.

And in the closely allied drug field, flavor—which largely depends on odor and is a function of essential oils—is indispensable in marketing numerous consumer items. Where would toothpaste be without mint flavoring?

► **For Masking**—In another vast group of products, the reason for using essential oils is not so much to create fragrance as to overcome malodor.

Many plastic and rubber prod-

RUGGED?



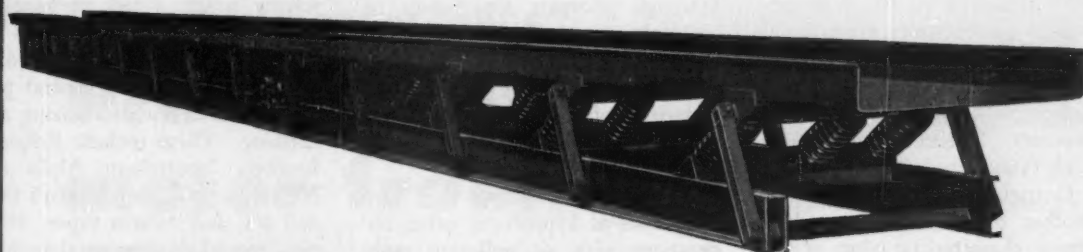
10 hp CARRIER CONVEYOR Moves 84,000 Foot-Tons Per Day!

THERE'S almost no limit to how rugged a Carrier Natural-Frequency Conveyor can get. Nor to what "impossible" jobs it can do. That's because Carrier Conveyors operate according to the laws of Natural Frequency and the application of this scientific principle was pioneered exclusively by Carrier.

NATURAL FREQUENCY: Carrier Natural-Frequency Conveyors substitute the natural resonant action of springs for brute force — thus UTILIZING the tremendous force of periodic

vibration which, before Carrier, was considered a liability. Most of the power needed to operate Carrier Natural-Frequency Conveyors is repeatedly stored up in the springs, and returned on every stroke. The result — *much less power required . . . far less maintenance . . . far less down-time!*

Carrier Natural-Frequency Conveyors are now delivering incomparably efficient, trouble-free performance for many of America's biggest industrials. Mail the coupon, *today*, for all the facts.



150 Tons Per Hour Of Foundry Sand Handled With 10 hp!

Handling up to 150 tons per hour of foundry sand—including occasional sprues and tramp iron—is a rough, tough job. But it's a cinch

for this 70-foot Carrier Natural-Frequency Conveyor! This big Heavy-Duty unit has a $\frac{3}{8}$ " steel-plate pan, 36" wide, and is powered by one

10 hp drive. Vibrated weight is approximately three tons. More than 50 giant coil springs are used. Full details gladly sent on request.

CARRIER ADVANTAGES

HIGH CONVEYING SPEED
(Up to 100 feet per minute)

GREATER CAPACITY
(Up to 200 tons per hour)

LESS POWER REQUIRED
(About one-third as much as "competitive" equipment)

LESS MAINTENANCE & DOWN-TIME
(Less power + good design = trouble-free performance)

NO DAMPENING UNDER LOAD
(Designed with extra power for specified load, with positive stroke)

SELF-CLEANING
(Continuous, smooth trough — no pockets)

COMBINES PROCESSING WITH CONVEYING
(Can screen, dry, cool, dewater, blend, etc.)

WIDTHS FROM 6" TO 48"—LENGTHS FROM 5' TO 250'
(With pans 16 ga to $\frac{1}{2}$ " plate, of any metal, open or enclosed)

BALANCES, VIBRATION-FREE UNITS AVAILABLE
(For use on ceilings or light floor construction)

CARRIER NATURAL-FREQUENCY CONVEYORS

Carrier Conveyor Corporation
2150 Frankfort Avenue, Louisville 6, Kentucky

Gentlemen: Without obligation, please send me Carrier Natural-Frequency Conveyor Bulletin No. 111.

Firm _____

Street _____

City _____ State _____

Att. Mr. _____ Dept. _____



TRAINED NOSES, like those of Shulton Inc.'s Oliver Marton and Steve Joffe, are indispensable in both perfumery and industrial odor control.

ucts give off unpleasant or downright offensive odors because of their chemical makeup. Effective deodorization, or masking with more appealing scents, is mandatory to gain consumer acceptance of such things as foam rubber mattresses and pillows, rubber girdles, plastic shower curtains and raincoats. Insecticides fall in this same category.

Outright deception is sometimes another object of odor masking. Strong characteristic odors of vital ingredients can provide clues for competitors seeking to duplicate secret formulas. Skillful masking of your product can at least delay rival analysts.

Another sort of masquerade is the motive for ingenious sprays that give automobiles that "new car" smell.

In the case of vinyl plastics, which now can be made to look like leather, odorants are being developed to reproduce the smell of leather, not merely overcome the plastic scent. Here the masking substance may involve use of fish oils, since the "leather smell" comes not from the hide itself but from the tanning process.

► **For Community Relations**—In manufacturing, industrial odorants are playing an increasingly big role in combating air pollution. Chemi-

cal process industries in this instance are major consumers.

Among those who have succeeded in reducing air pollution through odorants are makers of solvents, petroleum distillates, sulfate pulp, fertilizers, protein glue and antibiotics. Used properly, deodorizers often reduce community resentment and ease troublesome labor relations situations.

Aside from processes that have malodors as byproducts, other operations with air pollution problems are finding an answer in odor chemicals. The offensive smells coming from infections in hospitals and from animals in kennels and zoos are among the more familiar cases.

► **One Basis**—No matter what the needed deception, perfumery is the parent of odor chemistry. The firms that produce and combine essential oils for perfume makers perform just about exactly the same functions for industrial users of odorants.

Many of the same exotic natural essences derived from flowers, leaves, fruits, grasses, herbs, woods and resins find their way into both types of odorants. Cost, however, precludes use in industrial odorants of animal fixatives (civet, musk, ambergris) and the rarer floral oils—where an acre of hand-picked

flowers may yield only a few drops of oil.

The "art" of perfumery is also important in applying odorants to industrial purposes. No scientific method of measuring, analyzing or classifying odors—comparable, say, to spectral analysis of color—has been devised. The human nose is the only real yardstick, though some means of measuring characteristics related to odor are available. This makes the trained "nose" of perfume houses invaluable in tackling industrial odor problems.

► **One Plus One Equals Zero**—Modern industrial odor chemistry dates from the discovery by Hendrik Zwaardemaker, a Flemish scientist, that two substances, odorous individually, can be inodorous together. Zwaardemaker recorded a number of pairs of counteracting odorous substances—such as cedarwood and rubber—in 1895.

But each odor problem is an individual matter, which leaves the solving largely a task of imagination and experimenting.

In recent years, some leading firms have developed general purpose formulas for deodorizing and masking. These include Fritzsche Brothers' Neutroleum Alpha and Neutroleum Gamma, Sindar's Deodall #1, and Airkem vapor. However, special variations and methods of application even of these "general purpose" products may still be required to fit particular situations.

► **Formula for Success**—The basic chemical requirements for odor masks is that they not affect ultimate product quality, at least not adversely. Economically, they must be cheap relative to ultimate product value and must not impair process efficiency. This last, of course, accounts for the amazingly small volume of business done by the essential oils industry, compared with that of the consumer products using its services.

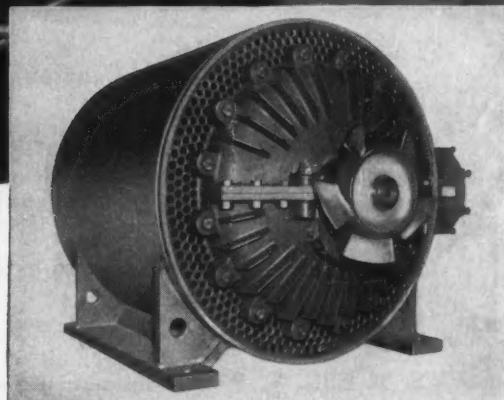
A few examples of recommended proportions of general purpose deodorants will illustrate how successful the essential oil people have been in meeting the economic challenge. (Continued)

ALLIS-CHALMERS Totally-Enclosed Fan-Cooled MOTORS



These heat exchanger tubes

Protect this motor from dirt and corrosion



3600-rpm explosion-proof motor with fan housing removed to show unidirectional fan.

COOLING AIR is carried through the heat exchanger tubes with sufficient velocity to expel practically all kinds of dirt. If oily or sticky dirt should cling, tubes can be ramrodded clean on the spot in a few minutes because tubes are straight and tube ends are exposed. Also, the tubes are distributed uniformly around the perimeter of the stator yoke and along its full length — cooling all parts of the motor evenly.

Choice of Corrosion-resistant Materials

You can lick corrosion with this motor, too. Tubes are available in a variety of materials to meet practically any corrosive atmospheric condition. Allis-Chalmers tube-type motors have long and successful experience in such difficult

applications as caustic plants, refineries and petrochemical plants, power plants with fly ash problems and many others.

Get Complete Information

Next time you need a motor for a dirty or corrosive location or for outdoor operation in all kinds of weather, call your Allis-Chalmers District Office. Get complete information on Allis-Chalmers tube-type totally-enclosed, fan-cooled and explosion-proof motors. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7149. Available in ratings on frames larger than NEMA 505 up to 3000 hp.

A-4559

ALLIS-CHALMERS



Sindar suggest a concentration of 0.001-0.01% of Deodall #1 for alleviating sulfurous odors in heating oil and 0.5% for combating fish odors in fertilizers. Fritzsche Brothers says that a pound of Neutroleum Alpha deodorizes 1,000 lb. of floor wax; an ounce deodorizes 50 gal. of kerosene for fly sprays. And Du Pont reports a successful case of a pulp mill adding about a quart of its Alamask reodorant to a digester retort along with nine tons of wood chips.

It's easy to see why industrial odorants seldom attain tank car stature.

Business Picking Up For Rubber Industry

Rubber consumption in 1955 should hit 1,255,000 tons, predicts H. E. Humphreys, president of U. S. Rubber. That's an increase of 4%. Dollar volume is expected to be about \$5 billion—roughly equal to 1953, the record year.

Demand for replacement tires should go up about 4%, and in view of 1955 production forecasts of auto makers, the tire market for new cars and trucks should also increase. "Altogether," says Mr. Humphreys, "we look for sales of

79 million passenger car tires and 12½ million truck and bus tires, for a total of 91½ million. This compares with 88 million in 1954 and 94 million in 1953."

In the field of non-tire rubber goods, Thomas Robins, president of Hewitt-Robins Inc., expects output to gain 3-6%. Indications are the 800 companies making these items will consume about 465,000 tons of rubber; about 440,000 tons were used in 1954. Mr. Robins also believes the tire makers' lead in raising prices last year will be followed by the makers of other rubber products.

GUIDED TOUR CONTINUED



PICTURED FLOWSHEET

Ketone made by catalytic dehydrogenation . . . 272

NAMES IN THE NEWS

S. T. Ellis, V. P. of Commercial Solvents . . . 279

Names that made news last month . . . 280

TECHNICAL BOOKSHELF

Newcomers for your reference shelves . . . 288

Recent books & pamphlets . . . 296

FIRMS IN THE NEWS


Who's doing what among your suppliers . . . 298

TECHNICAL LITERATURE

Manufacturers' new literature . . . 412


Catalytic dehydrogenation.

That's the key unit process in Shell's method of making tonnage synthetic methyl ethyl ketone. Here's how they do it in three big plants. (p. 272)




Losing your friends?

Could be if you aren't keeping close tabs on who's going where. Names in the News is your convenient checklist. (p. 279)



New technical literature . . .

You can now get—free and fast—literature on any subject in your field. Keep your technical files up to date. (p. 412)



**Join READER SERVICE
Page 401**

CONTEST

for Capable Engineers only

Guess the name of this manufacturer
of vacuum equipment

PRIZES:

1. **GRAND PRIZE** — Trip around the universe.
2. **SECOND PRIZE** — Option on the Brooklyn Bridge.
3. **THIRD PRIZE** — Six pairs of three-legged overalls.
4. **ONE THOUSAND RUNNER-UP PRIZES** — one thousand ouija boards.

CLUES:

1. Company founded in 1917.
2. Both original founders still active in the business.
3. Each founder has a son thoroughly trained in engineering who is also active in the business.
4. The company has specialized in jet vacuum equipment more than any one firm.
5. Has made hundreds of jet cooling units in capacities up to 3000 tons of refrigeration.
6. Makes an extensive line of other jet equipment including jet mixers, jet heaters, jet absorbers, jet pumps, and jet fume scrubbers.
7. Has designed and built thousands of barometric condensers in standard and a great variety of special materials.

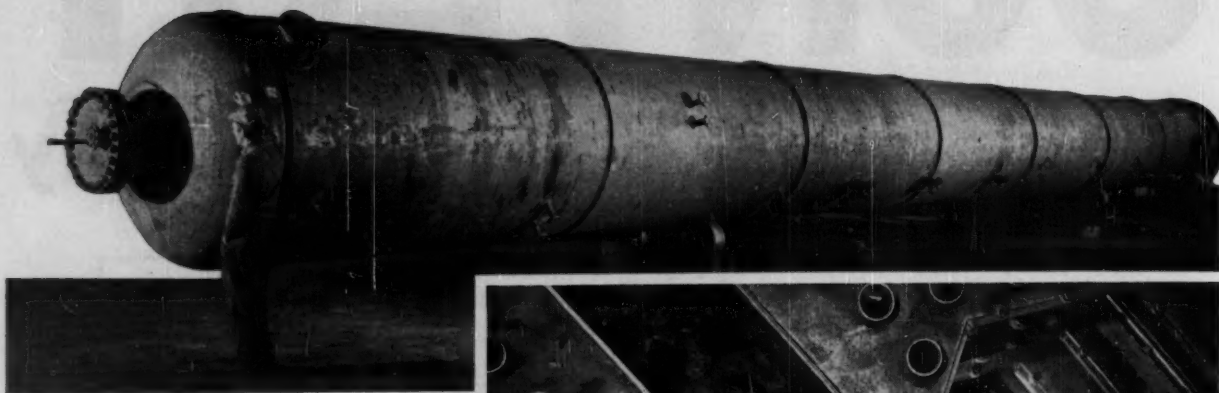
Why, of course it's

CHILLWATER UNITS • EVAPORATOR STEAM JETS • CONDENSING EQUIPMENT
Main Office — 751 Central Ave., Westfield, New Jersey Phone Westfield 2-4200
New York Office — 17 John Street, New York 38, N. Y. Phone Cortlandt 7-5531

CROLL-REYNOLDS CO., INC.

WHAT'S NEW IN WELDED VESSELS

MORE THAN MEETS THE EYE—Big as this depropanizer is—it's 90 ft 7½ in. long and 6 ft in diameter—you have to look inside to really appreciate it. Therefore, the internal view shown below. This all-welded tower, constructed to API and ASME codes, has ¾-in.-thick walls, and was tested in our Weldment Shop to 500 psi, well in excess of the 275 psi working pressure. The customer is a leading producer of industrial chemicals.



TAKE A LOOK INSIDE ►

Forty bubble trays are accurately positioned in the interior of this depropanizer, exterior view of which is shown above. Made of ¾-in. flanged steel plate, each tray is studded with 2-in. pipe risers. These, in turn, are equipped with cast-iron bubble caps and cast-steel anchors.



BUTADIENE PRODUCER

Shown on its way to a prominent Gulf Coast chemical plant, this husky solvent stripper tower will stand over 90 ft high installed. Its inside diameter varies from 8½ ft to 13 ft. Big, complex jobs like this require specialized equipment and skilled manpower. ▼



For further information about welded vessels, towers and other equipment for chemical and petroleum processing, call the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



CITRIC ACID



AMMONIUM CITRATE DIBASIC



OXALIC ACID

These Pfizer products
will help you

"CLEAN UP" IRON OXIDE PROBLEMS

● For industry's continuing fight against rust, Pfizer offers these proven products:

CITRIC ACID. An important chemical in many metal cleaning pastes and liquid formulations for both home and industrial use. Solutions of citric acid, partially neutralized with ammonia, are excellent rust and scale removers. Their use results in the least possible loss of metal. Moreover, citric acid has an extremely low order of toxicity.

AMMONIUM CITRATE DIBASIC. A dry product for

rust and scale removal with the same characteristics as the citric acid solutions partially neutralized with ammonia. It is of particular interest to manufacturers who market packaged home cleaners.

OXALIC ACID. Because Pfizer oxalic acid solubilizes iron oxide, it is the chief ingredient in radiator cleaning compounds. Combined with a wetting agent, oxalic acid solutions also find extensive use in washing railway cars and locomotives.

CHAS. PFIZER & CO., INC.

CHEMICAL SALES DIVISION

630 Flushing Ave., Brooklyn 6, N.Y.

Branch Offices: Chicago, Ill.; San Francisco, Calif.;
Vernon, Calif.; Atlanta, Ga.

For more information about
Pfizer products to "clean up"
iron oxide problems, send for
Technical Bulletins:

#15, Ammonium Citrate and
Citric Acid in Scale and Rust
Removal ☐

#61, Chemicals for Metal
Finishing ☐

#34, Oxalic Acid ☐
Dept. CE

NAME _____

TITLE _____

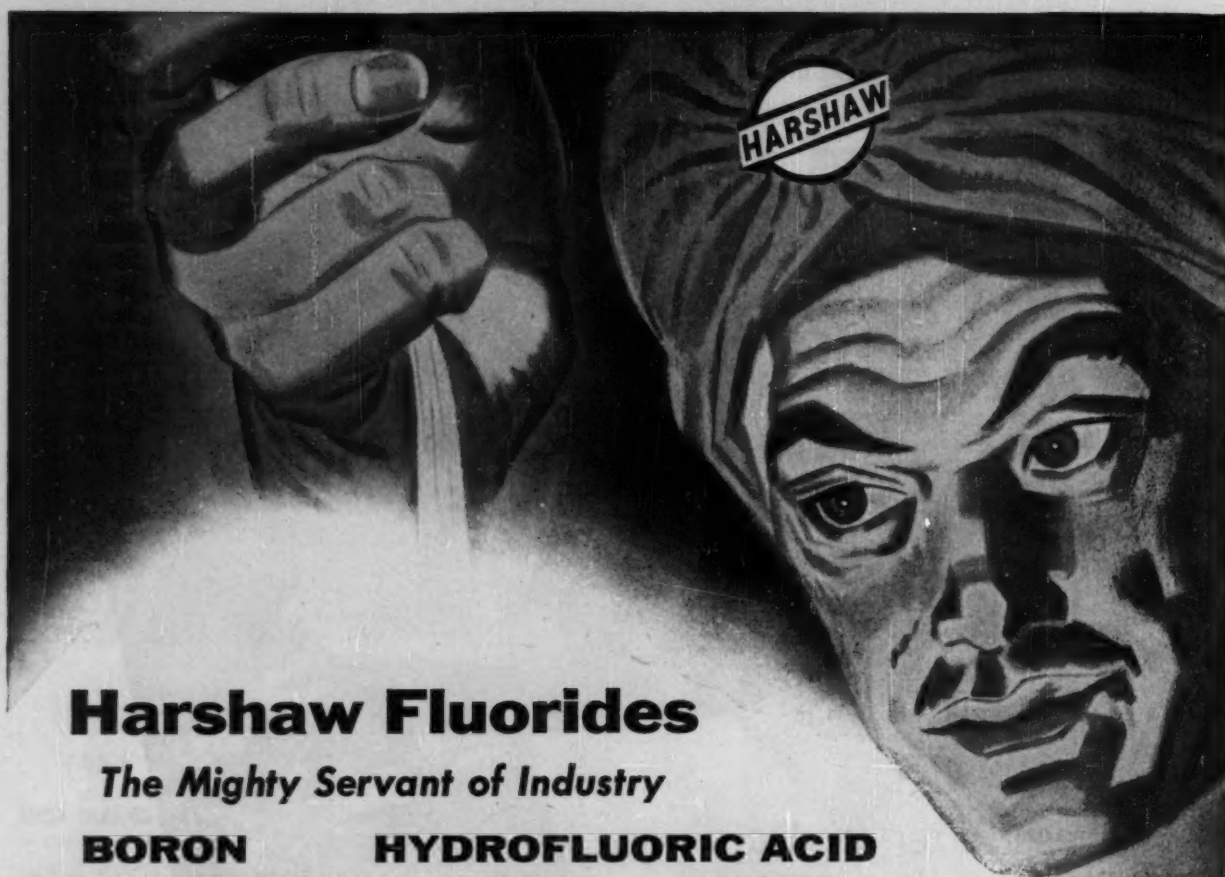
COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



Manufacturing Chemists for Over 100 Years



Harshaw Fluorides

The Mighty Servant of Industry

**BORON
TRIFLUORIDE**

HYDROFLUORIC ACID
ANHYDROUS . . . AQUEOUS

Here is an additional group of production-controlled, high-quality fluorides:

Ammonium Bifluoride
Ammonium Fluoborate
Antimony Trifluoride
Sublimed
Barium Fluoride
Bismuth Fluoride
Boron Trifluoride
Boron Trifluoride
Complexes
Chromium Fluoride
Copper Fluoborate
Fluoboric Acid
Fluorine Cells

Fluorinating Agents
Frosting Mixtures
Hydrofluoric Acid
Anhydrous
Hydrofluoric
Acid Aqueous
Hydrofluosilicic Acid
Lead Fluoborate
Metallic Fluoborates
Potassium Bifluoride
Potassium Chromium
Fluoride
Potassium Fluoborate

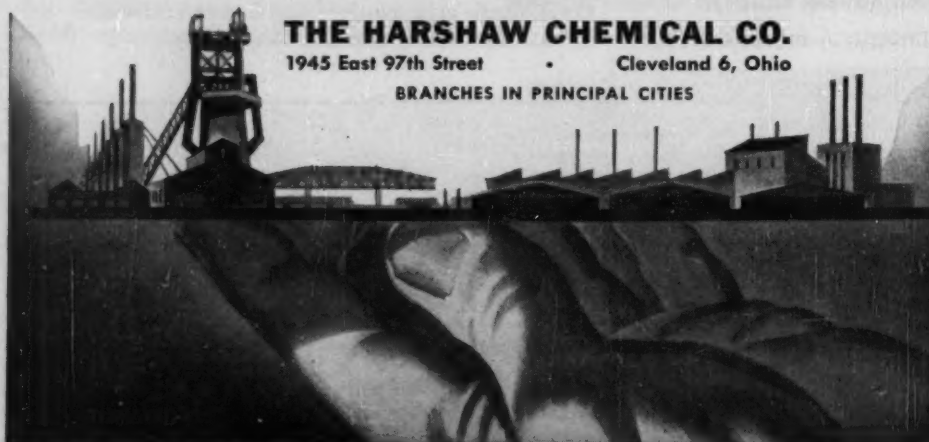
Potassium Fluoride
Potassium Titanium
Fluoride
Silico Fluorides
Sodium Fluoborate
Tin Fluoborate
Zinc Fluoborate
Zinc Fluoride

WRITE for Harshaw's 40-
page Book on Hydrofluoric Acid
Anhydrous. It provides helpful
data for you if you now use
HF or are considering its use.

THE HARSHAW CHEMICAL CO.

1945 East 97th Street • Cleveland 6, Ohio

BRANCHES IN PRINCIPAL CITIES



*inside and
outside*

HACKNEY TWO-PIECE ACID DRUMS

...are designed to protect your shipments
of corrosive and poisonous chemicals



INSIDE

- 1 Smoother interiors are exceptionally easy to clean—are free from cracks and crevices.
- 2 This extra-smooth butt weld joins the two entirely seamless halves of the drum.
- 3 Here is the seamless formed chime used on the 15-, 20, and 30-gallon sizes.
- 4 Here is the seamless, reinforced chime construction for the larger 55- and 110-gallon sizes.

OUTSIDE

- 5 Sturdy I-Bar rolling hoops—protect the seam and spud against hard knocks.
- 6 Heavy, forged spud is firmly welded—becomes an integral part of the drum itself.
- 7 Two-piece construction eliminates head and longitudinal seams (no crevice corrosion), increases strength and shock resistance.
- 8 Heavy, curled foot ring reinforces chime on the larger sizes—withstands transportation abuse.

Fully described in the new Hackney Drum and Barrel Catalog. Send for your copy today.

Pressed Steel Tank Company

Manufacturer
of Hackney Products

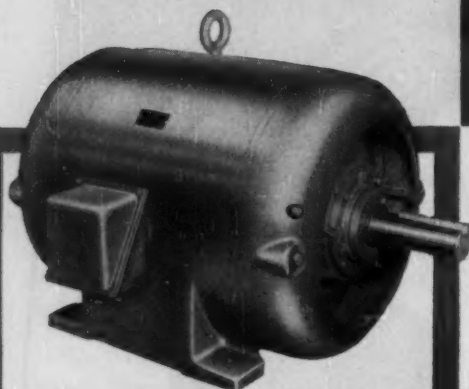


1447 S. 66th St., Milwaukee 14 • 52 Vanderbilt Avenue, Room 2025, New York 17 • 203 Hanna Bldg., Cleveland 15 • 936 W. Peachtree St., N.W., Room 113, Atlanta 3 • 208 S. LaSalle St., Room 792, Chicago 4 • 553 Roosevelt Bldg., Los Angeles 17 • 18 W. 43rd St. Room 15, Kansas City 11, Mo. • 140 Wallace Ave., Downingtown, Pa.

CONTAINERS FOR GASES, LIQUIDS, AND SOLIDS



use
WAGNER
 Cast Iron Frame
 Motors for
EXTRA PROTECTION
 in corrosive
 atmospheres



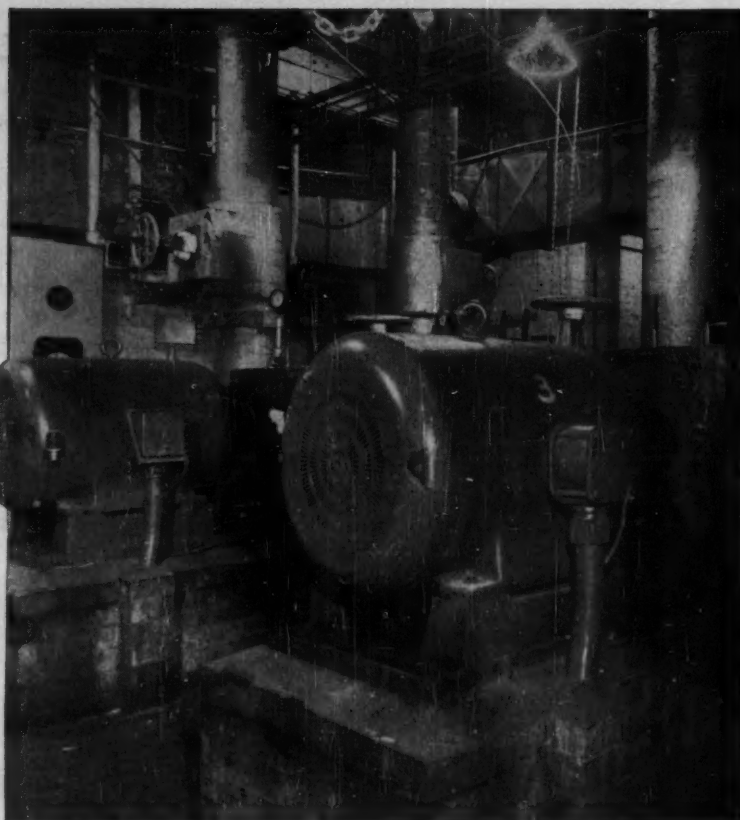
Type EP, totally-enclosed fan-cooled. Available in ratings from 2 to 250 hp.



Type JP, non-ventilated. Explosion-proof. $\frac{1}{2}$ through $1\frac{1}{2}$ hp.



BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES



These 150 hp Wagner Cast Iron Frame Motors drive brine pumps in an acid area at Celanese Corporation's Rock Hill, S. C. plant.

If the motors in your plant are subjected to corrosive fumes and liquids, Wagner Cast Iron Frame Motors will provide the *extra protection* you need.


These stock motors are totally-enclosed in corrosion-resistant cast iron. All parts exposed to the atmosphere are fabricated of corrosion-resistant material—even the nameplate. Features include completely protected laminations... special varnish treated windings... a running shaft seal.

Wagner Cast Iron Frame Motors are available in fan-cooled standard and explosion-proof types in ratings from 2 to 250 hp, and in non-ventilated standard and explosion-proof types in ratings from $\frac{1}{2}$ through $1\frac{1}{2}$ hp. Wagner Bulletin MU-132 gives complete information.

A skilled Wagner engineer will help you select the Wagner Motor to meet your most exacting specifications. Call the nearest of our 32 branch offices, or write us.

WAGNER ELECTRIC CORPORATION
 6407 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

ELECTRIC MOTORS
 TRANSFORMERS
 INDUSTRIAL BRAKES
 AUTOMOTIVE
 BRAKE SYSTEMS—
 AIR AND HYDRAULIC



**for TOUGH
fluid and gas
handling jobs**

ATLANTIC

FLEXIBLE METAL HOSE

Conveying nitric acid for use in batch nitrations is quick death for ordinary flexible metal hose. Sulphuric acid and plating solutions are other notorious killers. When temperature and pressure extremes and adverse handling conditions are also involved, hose replacement is frequent and expensive.

That's why—for tough jobs—it's good economy to specify Atlantic flexible metal process hose. Manufactured to survive the most destructive use, it is unequalled for leak-proof qualities, flexibility, durability, strength and lightness. It performs long after ordinary hose is scrapped and returns real savings in your material and labor dollar.

Whatever your application — conveying, controlling movement and vibration, correcting misalignments, compensating for expansion and contraction — there is an Atlantic flexible metal hose that is best for it.

Available in Seamless or Interlocking construction: Steel, stainless steel, monel, bronze. 4"—36" I.D. Inclusive with appropriate fittings.

Our engineers have developed flexible metal hose for a number of classified nuclear applications. Though these types cannot be released at present, the experience gained is available for any unusual problems you may have.

Write for Chemical and Process Industries Bulletin 20D.

See our Catalogs in Sweet's Files for
Product Designers
and Mechanical Industries.



ATLANTIC

ATLANTIC METAL HOSE CO., INC.
329 Dyckman St., New York 34, N. Y.

New Ethylbenzene Plant

*—straddles
a salt marsh!*

The Williams Plant at Port Arthur, Texas. This Ethylbenzene Plant was built on a salt marsh by Koppers Engineering and Construction Division.



NORMALLY, land that is under water isn't a good place for a plant site. Yet, at Port Arthur, Texas, there was a stretch of salt marsh that was ideal in every other respect.

So Koppers engineers were called into consultation. They were asked: "Could you possibly build a chemical plant on this swamp?" They *could* . . . and did.

The land was drained. Roads were built. Structures were supported on deep-driven pressure-creosoted wood piles (Even the smallest pump was placed on piles!)

Now, on land that was formerly useless, the Williams Plant is producing high-purity Ethylbenzene, proving that the best engineering skill can overcome the worst obstacles.

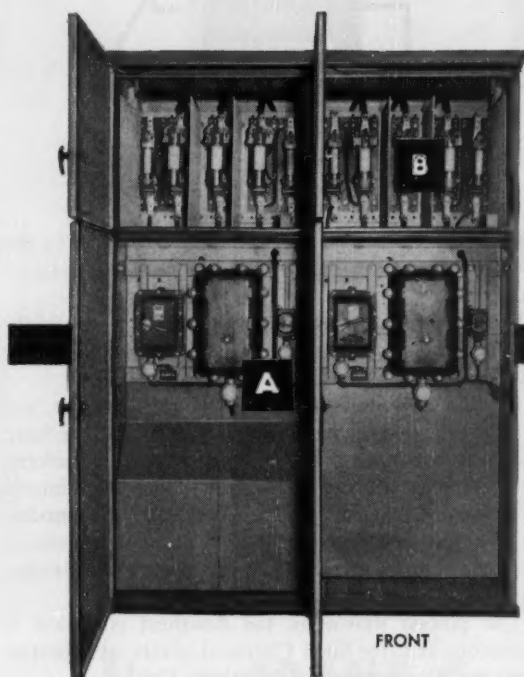
Put your design and construction problems—conventional or otherwise—in the capable hands of our engineering staff. Your inquiry is invited.

KOPPERS COMPANY, INC.

Engineering and Construction Division
Chemical and Gas Dept.
Pittsburgh 19, Pennsylvania



Engineered for **SAFE** Operation in Semi-Hazardous Locations



Built into every Allis-Chalmers Type H starter is the type and degree of protection dictated by applications. In these particular starters, installed in a semi-hazardous location, all arcing contacts are under oil or in explosion-proof cases.

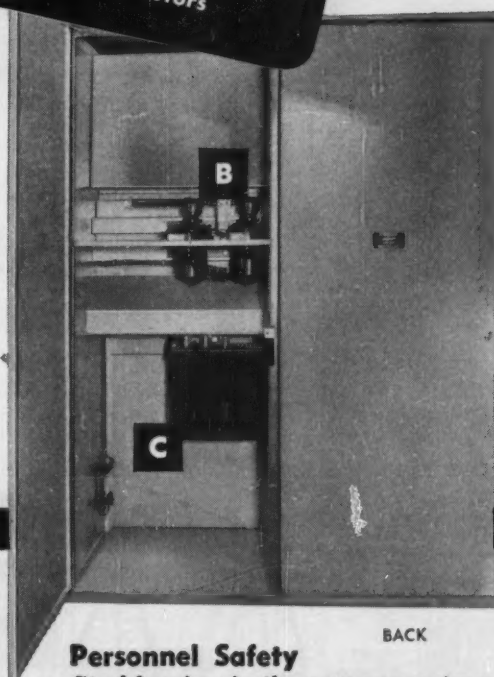
ALLIS-CHALMERS
TYPE H Starters
for 2300 to 5000
Volt Motors

A All overload, undervoltage, timing and auxiliary control relays, as well as other low voltage switching devices, are enclosed in NEMA VII explosion-proof cases.

B Fuse disconnects cannot be pulled when carrying current. Fuse compartment door is *key-interlocked* to the control transformer primary oil cutouts.

C Main contactor is of the oil-immersed type.

Type H starters are built in a wide range of ratings for squirrel-cage, wound-rotor and synchronous motors — for full or reduced voltage, reversing or non-reversing — with plugging, dynamic-braking and multi-speed features. A new bulletin, 14B6410B, tells the complete story. See your nearby Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.



Personnel Safety

Steel barriers in the rear compartment prevent accidental contact with exposed live high voltage parts when operating the oil cutouts or removing the interlock key.

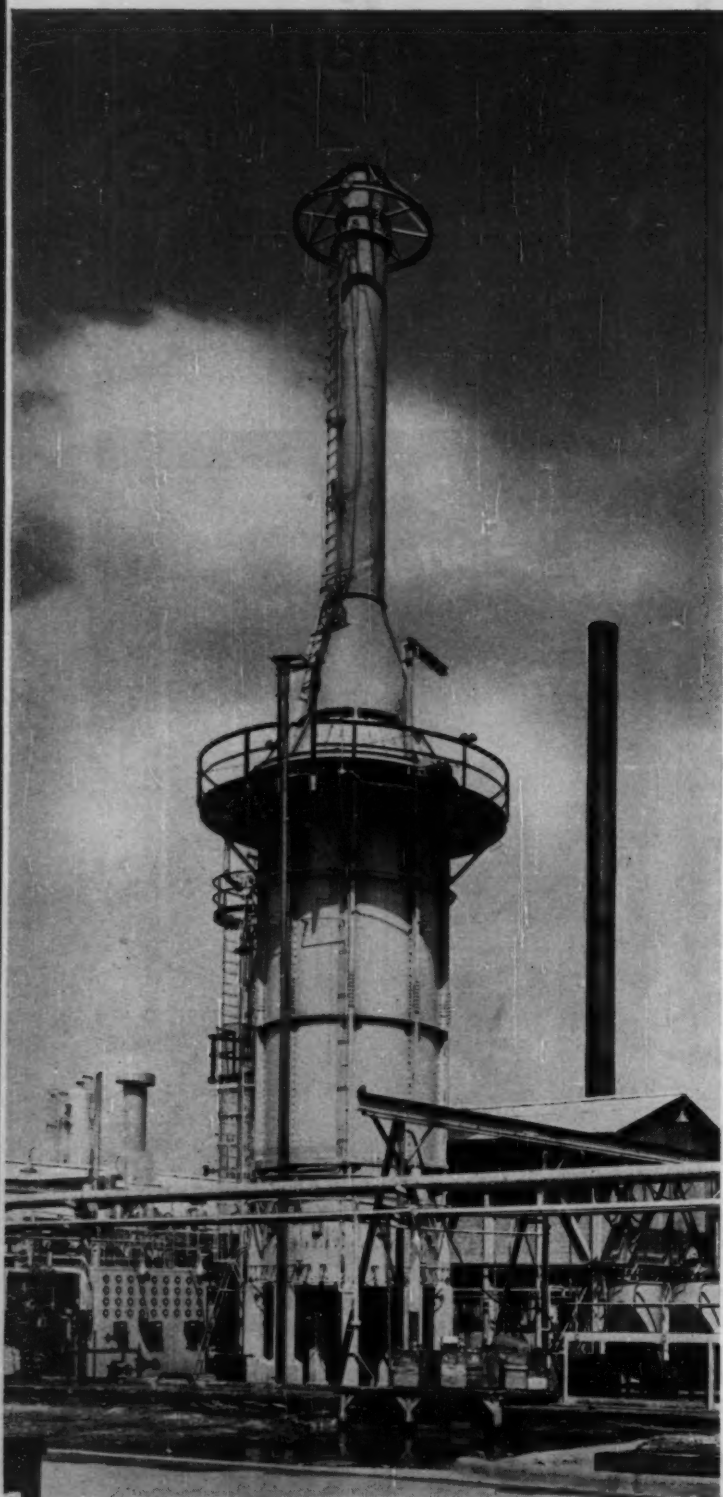
A-4446

ALLIS-CHALMERS

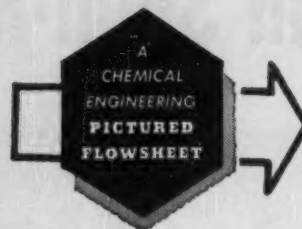


KEY TO SYNTHETIC METHYL ETHYL KETONE:

Catalytic Dehydrogenation



DEHYDROGENATOR: where alcohol is converted to ketone.



THERE are many factors which contributed to the rapid growth of methyl ethyl ketone as a commercial solvent.

But one factor stands out above all the rest—the development of a synthetic catalytic process—pioneered by the Shell Chemical Corp., for making MEK.

It has a lower rate of evaporation than acetone, and is an excellent solvent for nitrocellulose and synthetic resins. But it was not widely accepted until a uniform, pure product became available.* Now three-fourths of all domestic MEK production (total U. S. production—168 million pounds in 1953) flows to the surface coating industry. Increasing use has been as a dewaxing agent in the refining of lubricating oils.

The process shown on the flowsheet is typical of operations at three Shell Chemical plants—at Houston, Tex., and Dominguez and Martinez, Calif.

► **A Critical Step: Dehydrogenation**—Briefly, MEK is formed by the catalytic dehydrogenation of sec-butyl alcohol. It's a vapor phase reaction, occurring in a vertical reactor packed with a copper-bearing catalyst. Heat is supplied by the combustion of fuel gas.

► **How the Process Works**—A butylene-butane mixture containing 30-50 mole % butylene feeds into an absorption tower. With temperature and pressure, concentrated H_2SO_4 selectively absorbs butylene, forming butyl sulfate and di-butyl sulfate.

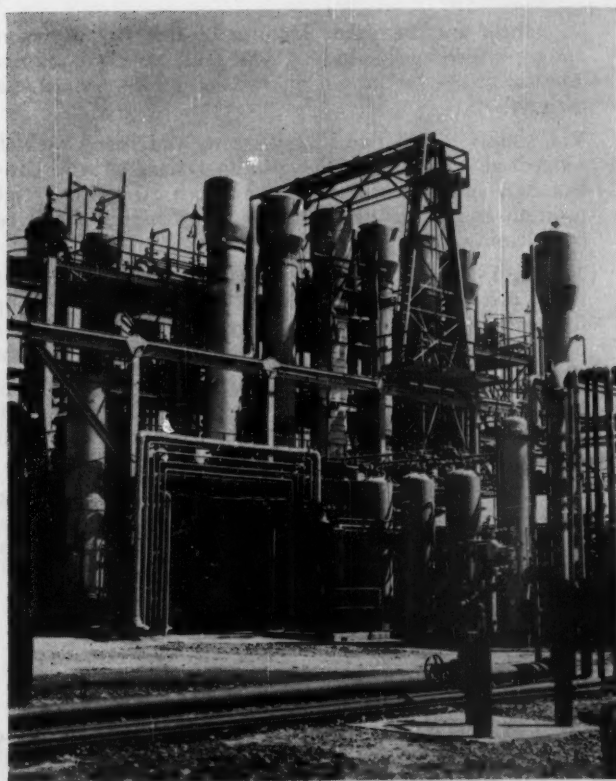
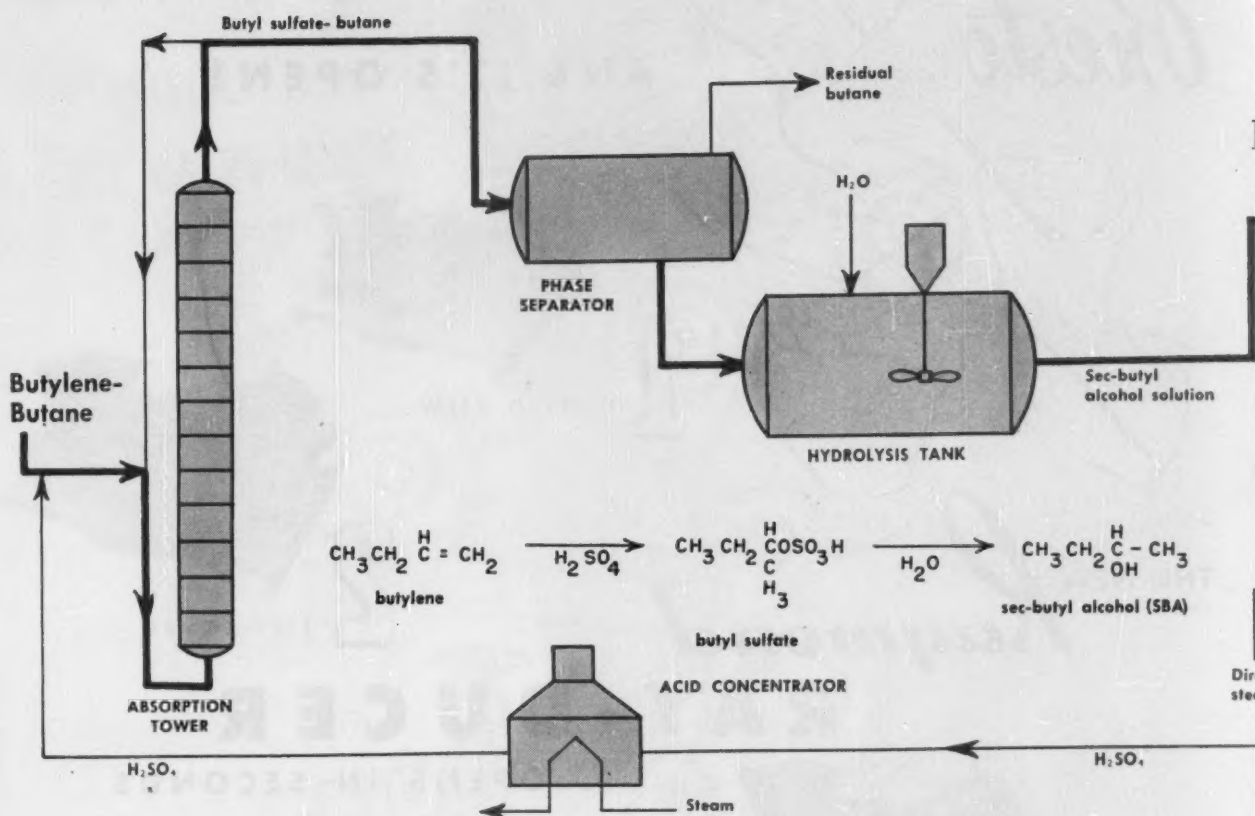
The hydrocarbon phase (mostly butane) is removed in a phase separator.

Water hydrolyzes the butyl sulfates, forming sec-butyl alcohol and dilute sulfuric acid. This alcohol is recovered in an acid-brick-lined stripping column, having silicon iron Turbogrid trays. Direct steam is injected; dilute sulfuric acid comes out as bottoms product, crude SBA is the top product.

Acid is reconcentrated for reuse. And water, light and heavy byproducts are removed from the crude SBA in a two stage distillation unit.

Pure SBA goes to the dehydrogenator, where MEK and H_2 are produced. Condensed in a brine-cooled condenser, liquid MEK—after separation of H_2 —is purified in a two-step distillation unit. Water is removed here, and SBA recycled back to the SBA columns.

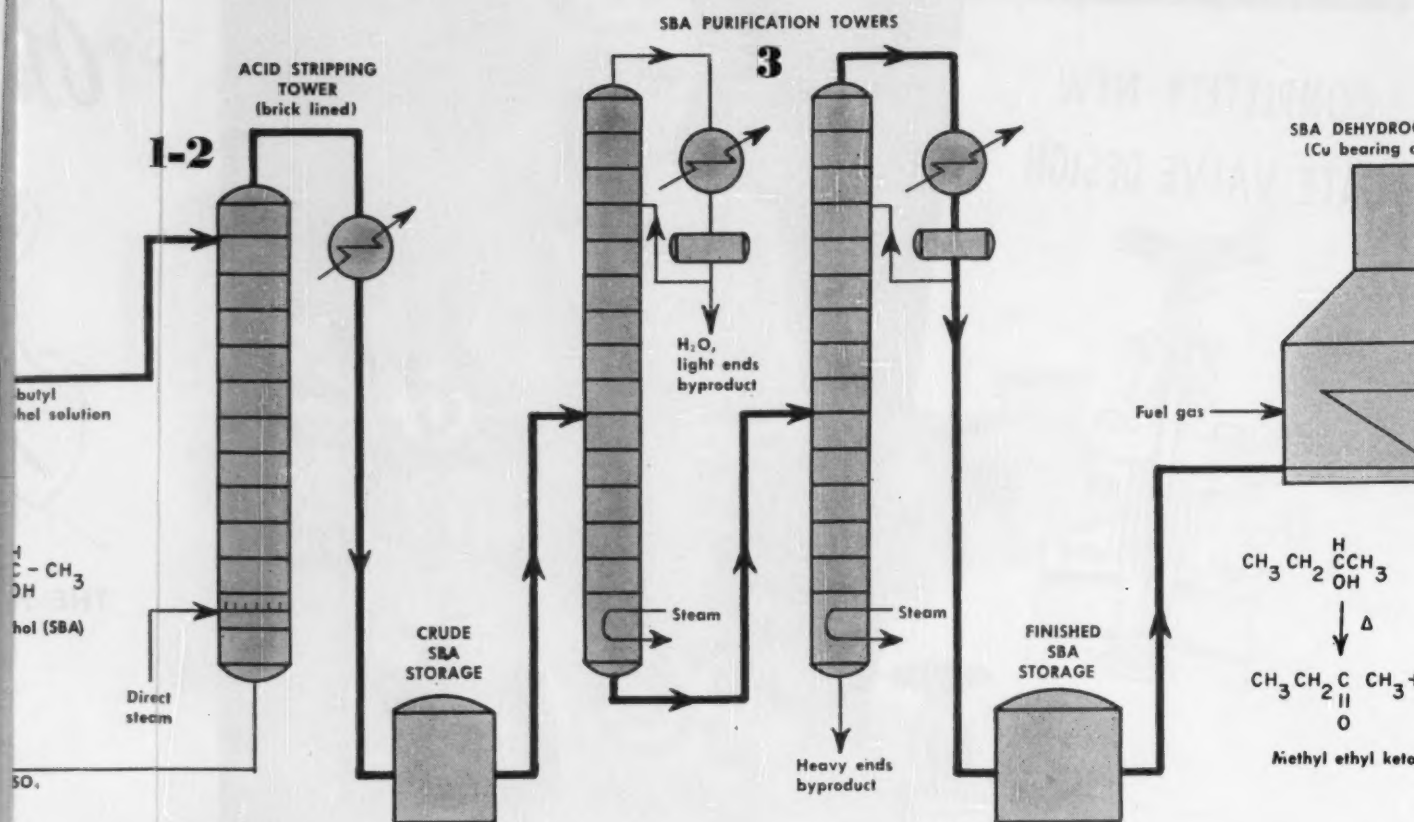
*Once available as an impure byproduct of wood distillation.



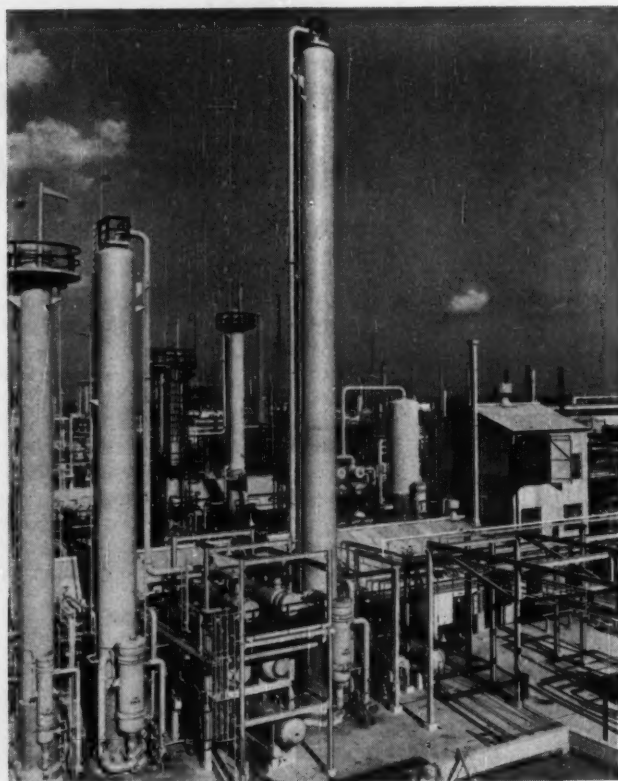
1 SEC-BUTYL ALCOHOL STRIPPERS. Here crude alcohol is separated from sulfuric acid by steam stripping.



2 SILICON IRON TURBOGRID TRAYS are used in the stripper shell is lined with acidproof brick. Corrosion-resistant.



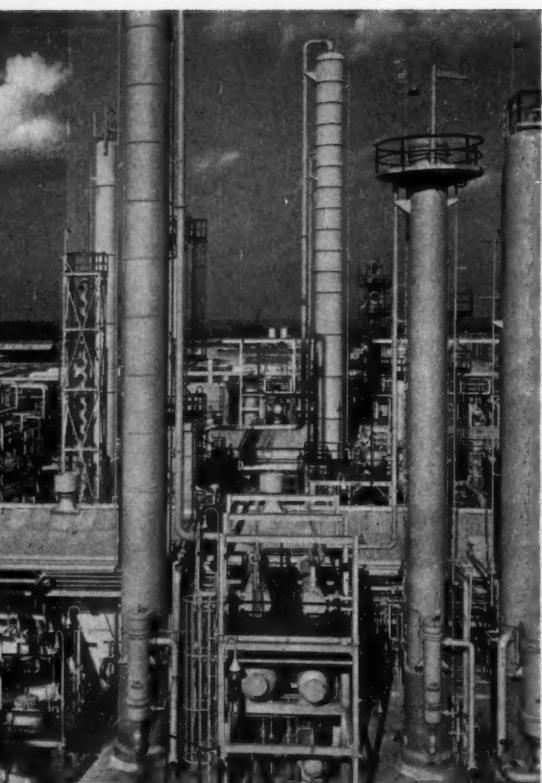
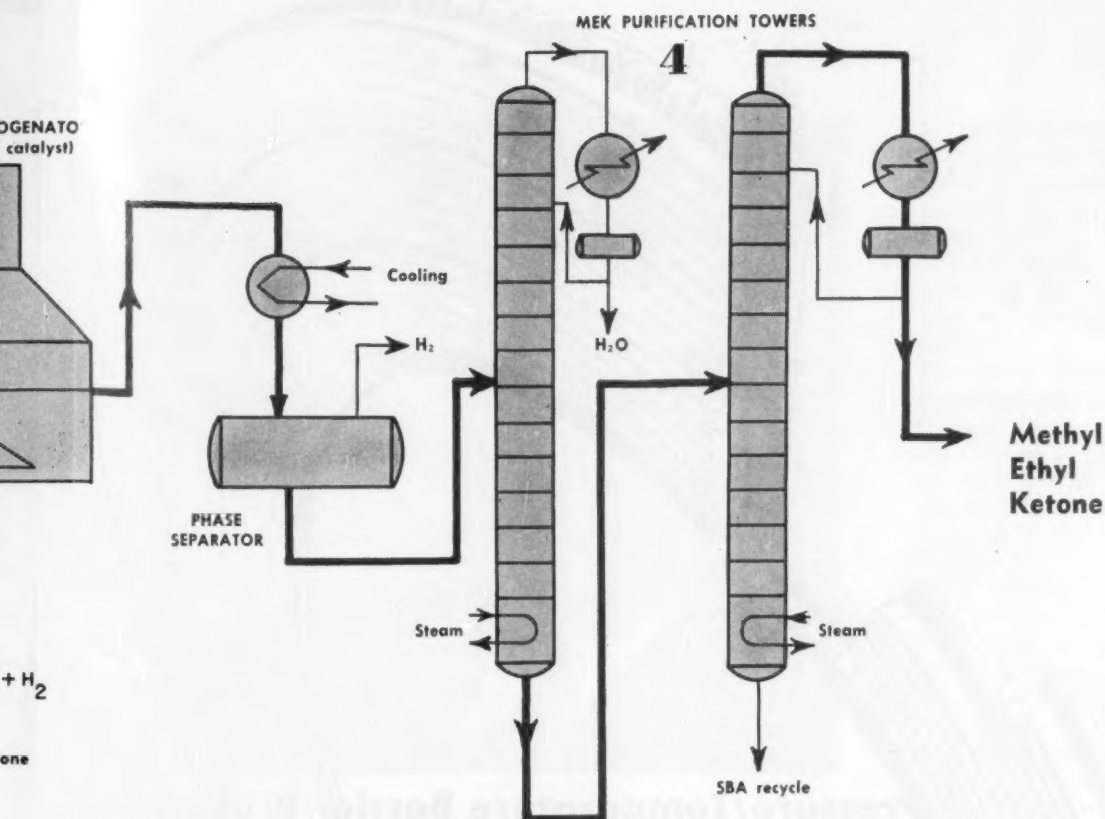
3 **TRAYS** are used in the stripping column, while the steel is lined with brick. Corrosion is kept to a minimum.



3 **SBA DISTILLATION** columns, where water, light and heavy ends are removed. Next step is dehydrogenation.



4

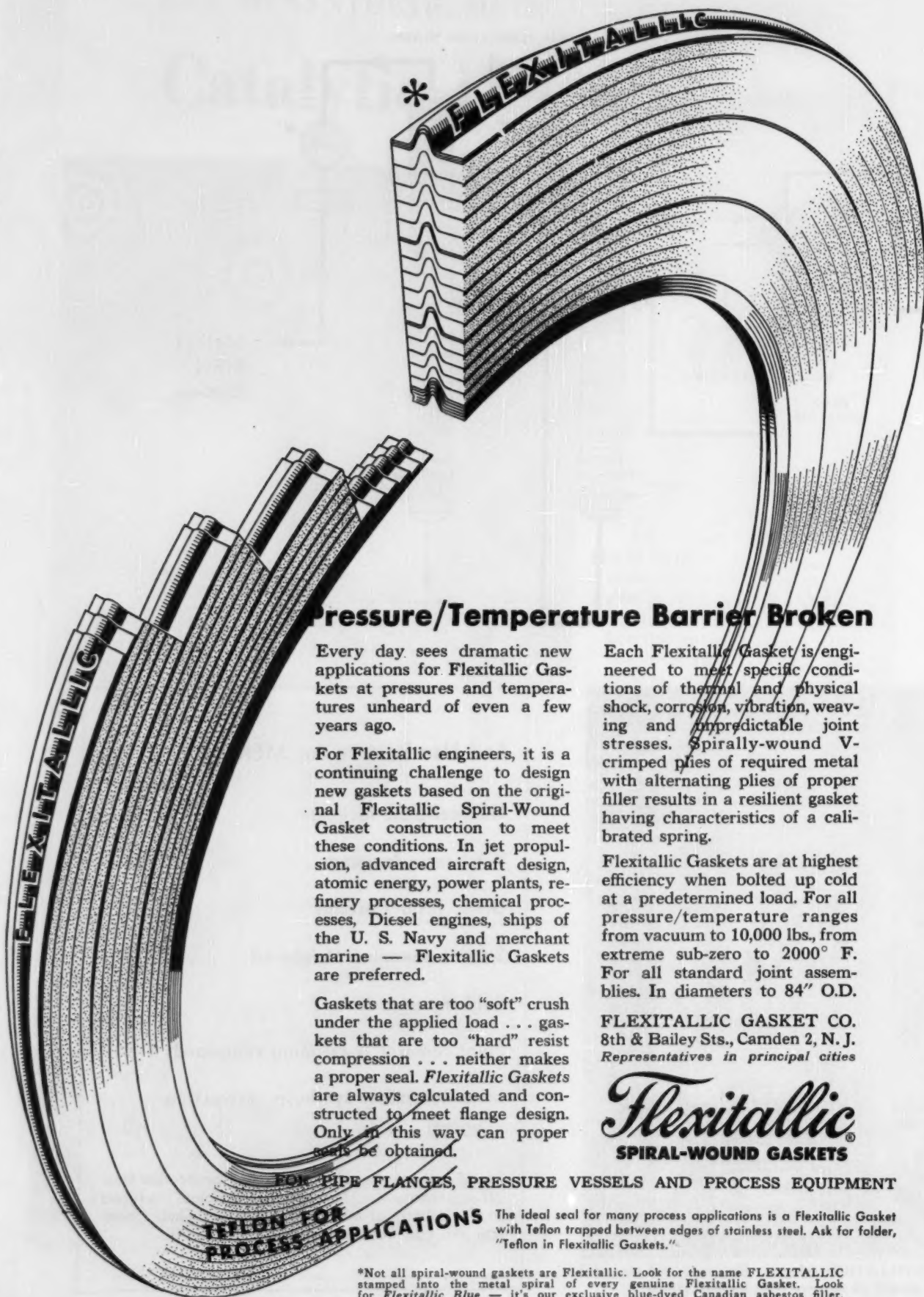


MEK DISTILLATION columns. Here water and unreacted sec-butyl alcohol are removed from the final product.

End Use Pattern for MEK

	Percent*
Nitrocellulose lacquers	38
Vinyl resin lacquers.....	37
Other resin coatings.....	2
Solvent dewaxing of lube oil.....	10
Rubber cements	5
Paint remover & cleaning compounds	3
Misc. (chemical synthesis, extracting agent)	5

*A CE estimate based on total U. S. production from all manufacturers. There are two principal producers in this country of methyl ethyl ketone—Shell Chemical and Esso Standard Oil.



Pressure/Temperature Barrier Broken

Every day sees dramatic new applications for Flexitallic Gaskets at pressures and temperatures unheard of even a few years ago.

For Flexitallic engineers, it is a continuing challenge to design new gaskets based on the original Flexitallic Spiral-Wound Gasket construction to meet these conditions. In jet propulsion, advanced aircraft design, atomic energy, power plants, refinery processes, chemical processes, Diesel engines, ships of the U. S. Navy and merchant marine — Flexitallic Gaskets are preferred.

Gaskets that are too "soft" crush under the applied load . . . gaskets that are too "hard" resist compression . . . neither makes a proper seal. *Flexitallic Gaskets* are always calculated and constructed to meet flange design. Only in this way can proper seals be obtained.

Each Flexitallic Gasket is engineered to meet specific conditions of thermal and physical shock, corrosion, vibration, weaving and unpredictable joint stresses. Spirally-wound V-crimped plies of required metal with alternating plies of proper filler results in a resilient gasket having characteristics of a calibrated spring.

Flexitallic Gaskets are at highest efficiency when bolted up cold at a predetermined load. For all pressure/temperature ranges from vacuum to 10,000 lbs., from extreme sub-zero to 2000° F. For all standard joint assemblies. In diameters to 84" O.D.

FLEXITALLIC GASKET CO.
8th & Bailey Sts., Camden 2, N. J.
Representatives in principal cities

Flexitallic
SPIRAL-WOUND GASKETS

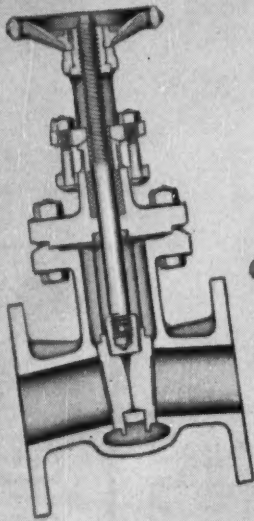
FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

**TEFLON FOR
PROCESS APPLICATIONS**

The ideal seal for many process applications is a Flexitallic Gasket with Teflon trapped between edges of stainless steel. Ask for folder, "Teflon in Flexitallic Gaskets."

*Not all spiral-wound gaskets are Flexitallic. Look for the name FLEXITALLIC stamped into the metal spiral of every genuine Flexitallic Gasket. Look for *Flexitallic Blue* — it's our exclusive blue-dyed Canadian asbestos filler.

COMPLETELY NEW GATE VALVE DESIGN



New CRANE Corrosion-Resistant Valves in 18-8 SMO and Craneloy 20

Gate, Globe and Angle Patterns

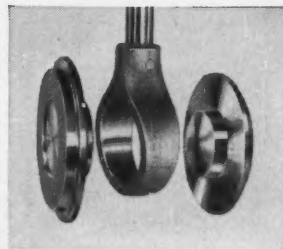
Few valves for process industries have ever received the quality treatment given this new Crane line.

Note, for instance, the unique yet simple split-wedge disc construction in the gate valves. Those dual identical discs are free to rotate in their holder—the most effective design for resisting galling. The trunion shape at the back of each disc assures even distribution of closing forces. You couldn't buckle them if you tried.

The globe and angle valves give equally

outstanding control of corrosive fluids. A new type disc-stem connection, with minimum clearances, practically eliminates vibration. By placing seating load closer to seats, it provides easier, more accurate closure.

Throughout, these valves are built for better service in your choice of Crane 18-8 SMO Stainless Steel or Craneloy 20. Both lines come with screwed or flanged ends. Full information given in circular AD 2059—available from your Crane Representative or on request to address below.



New split-wedge disc in gate valves combines the benefits of free rotation with uniform seat load pressure.

CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas



VALVES • FITTINGS • PIPE • PLUMBING • HEATING

CRANE'S FIRST CENTURY . . . 1855-1955

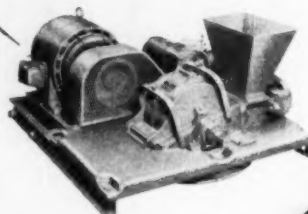
Presto

AND IT'S OPEN!



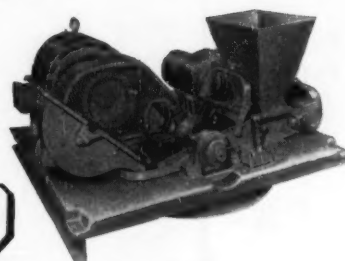
1

CLOSED VIEW



2

LIFT COVER



THE NEW

Raymond

RAY-DUCER

...OPENS IN SECONDS

ACCESSIBILITY . . . SIMPLICITY . . . COMPACTNESS

. . . these are the prime features of this new Raymond design, which make the RAY-DUCER so easy and economical to use for producing various grades of powdered materials.

You simply loosen two thumb screws and swing back the hinged cover, exposing the grinding chamber with rotor, hammers and screen unit. Rotate screen carrier to upright position and it can be lifted out for changing the screen by releasing a couple of cam locks.

The RAY-DUCER is such a great time saver that it definitely cuts the cost of production. In making new set-ups for handling different kinds of materials, complete clean-outs and screen changes can be made in a few minutes.

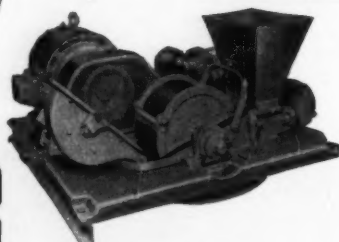
Built in three sizes for various capacities, the RAY-DUCER is a high-speed swing-hammer pulverizer with screen separation, which has a host of applications in the chemical, food and process industries.

Dry colors, dyestuffs, filter-cakes, chemicals, pigments, synthetic materials, food mixtures, soap powders, some of the softer non-metallics, are typical applications for this RAY-DUCER.

SEND FOR IT.

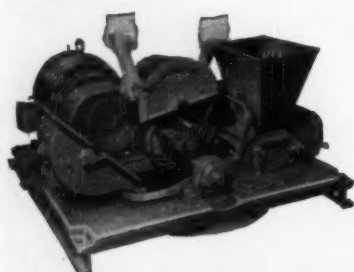
3

TILT CARRIER



4

TAKE OUT SCREEN UNIT



Raymond RAY-DUCER Bulletin gives complete construction details and applications

COMBUSTION ENGINEERING, INC.
Raymond Division

1311 North Branch St.
 Chicago 22, Illinois

Sales Offices in
 Principal Cities



Sydney T. Ellis: Man of the Month

New executive vice president of Commercial Solvents has had a fast-moving, colorful engineering career.

When Sydney Ellis was named executive vice president of Commercial Solvents Corp. recently, it marked the highpoint of a career that has carried him over most of the world and through nearly every phase of the chemical industry. Only 41, the new exec has virtually sprinted through the industry's ranks.

From a mid-depression start in production with Du Pont, he moved into development work, paper converting, overseas military construction in the Southwest Pacific and along the Burma Road during the war, chemical plant building and rebuilding in South America and, finally, decision-making as a chemical company executive.

► **Decided Early**—In character with his speedy ascent in industry, Syd wasted no time in choosing a career.

For as long as he can recall he had his sights trained on engineering. While in high school he talked with several different kinds of engineers and came away from these conversations thoroughly impressed with chemical engineering. "It looked like one in which there was no ceiling on a man's progress," he says.

After high school, he enrolled in Virginia Polytechnic Institute. And four years later, after working most of his way through, he graduated—smack into the depths of the country's worst depression.

► **Development His Forte**—Fortunately, he latched onto a production job with Du Pont. Here he acquired a lifelong liking for the development aspects of production.

In 1937, after three years with Du Pont, he was offered a chance to handle an entire project in engi-

neering development by the Wortendyke Manufacturing Co. Syd joined Wortendyke and spent the next four years shepherding several paper converting processes through from idea to sales.

Meeting this challenge successfully was a major factor in his career.

► **Served in Engineers**—His next job change came in 1941—this time at Uncle Sam's insistence. With the outbreak of the war, he went on active duty as a lieutenant in the army engineer corps.

During his five years of service, he spent about a year and a half in the Southwest Pacific and another two years in the China-Burma-India Theater building air fields and other military projects. His tour was spiced with some combat duty, and a short interlude as an official greeter and guide, welcoming VIP's to Calcutta.

By discharge time in 1945 he had attained the rank of lieutenant colonel and had picked up a Bronze Star—and a bit of engineering resourcefulness—along the way.

► **Headed South**—After his discharge, Syd joined W. R. Grace & Co. and spent what he terms "an instructive and profitable five years" in South America and in Europe helping extend Grace's far-flung interests.

This gave him the chance to match his resourcefulness against a wide range of engineering problems. For example, there was the time he had to reconstruct a damaged Peruvian chlorine plant using local materials ranging from broken beer bottles (for tower packing) to rubber inner tubes from truck tires (for shipping acids).

To complicate the problems of working in a foreign country with foreign help, his interpreter was hurt on the first day and he had to learn Spanish while directing the job.

► **Joined CSC**—When he was offered the post of assistant to the president of Commercial Solvents in 1951, Mr. Ellis left Grace. Shortly after, he was appointed a vice president, and later became

BRAND-NEW FIRE KILLER!



Leave it to Kidde to come up with a red-hot idea like this — a big, new 10-pound dry chemical extinguisher that's effective at *any* pressure from 150 to 250 pounds!

Naturally, this new Kidde 10-pounder has all the special features that make the Kidde Dry Chemical line second to none — fast action, easy handling, simple trigger operation, and extra-wide coverage that snuffs out fire in seconds. But the "wide operating range" feature is what makes the 10-pounder a real standout!

Unlike other extinguishers, which usually operate at one pressure only, the Kidde 10-pounder works through an extremely wide pressure range. Even when charged as low as 150 pounds, the Kidde 10-pounder is UL-approved for Class B and C fires. Boost the charge to 250 pounds, and you have a fire extinguisher with an *extra* hard-hitting punch!

For fighting fires in deep-burning liquids, electrical machinery and other hard-to-get-at places, *nothing* beats a Kidde Dry Chemical Extinguisher. Good for fires in textiles, too! See to it that *you* have Kidde protection. Call Kidde today!

Kidde



Walter Kidde & Company, Inc.
228 Main Street, Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freeze' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

NAMES . . .

administrative vice president and a company director.

Since CSC was just getting under way on an investment-doubling expansion program, at the time he joined the company, Ellis was pitched right into the broad problems of chemical company management, from financing to sales.

► **Home First**—To relax from these problems Syd retires to his home in suburban Irvington-on-Hudson, N. Y. He has an inflexible rule not to bring work home. He'll stay in town all night if necessary to get a job done, but when he leaves the office he goes home to enjoy the company of his wife, Jane, and their two children, Ruth, 3, and Tommy, 14—and not to work.

So wrapped up is he in his home life that he gave up playing what he calls "a pretty good game of golf" to spend more time there.

After living in hotels and apartments for so many years he feels that there's nothing better than going home and romping with the kids, or maybe going down into his well equipped cellar workshop, turning on the radio and enjoying woodworking, one of his hobbies. In the summer, the whole family turns out for a little gardening, or as he puts it, "moving the shrubs around."—HTS

Ralph G. Holben—Vice president in charge of manufacturing, Conoflow Corp., Philadelphia, Pa. Mr. Holben, formerly plant manager, will be responsible for the supervision of production, purchasing and maintenance of plant facilities.

Desmond L. Farrell—Production superintendent of Industrial Rayon Corp.'s nylon staple fiber plant at Covington, Va. **Robert E. Morey** is assistant plant engineer.

George H. Freyermuth—Executive vice president and a director of Esso Export Corp., the international sales affiliate of Jersey Standard.

R. A. Bintz—Assistant director of manufacturing, National Starch Products.

James D. Bell—Supervisor of production at General Electric Co.'s alkyl resin plant, Schenectady, N. Y.

W. S. Smith—Chief engineer of Petroleum Maintenance Co. in Long Beach, Calif. In addition to his responsibilities in sales engineering and personnel relations, Mr. Smith will be an administrative assistant to the firm's general partner and manager, W. A. Thompson, Jr.

Verland W. Belt—General superintendent of the Ohio Injector Co. at Wadsworth, Ohio. **Norman A. Malone** has been named chief manufacturing engineer of the company.

C. G. Stupp—Vice president of the Barrett Division, Allied Chemical & Dye Corp. Mr. Stupp, technical director of Barrett since 1951, will continue to head technical activities of the Division, including the research and development department.

Grenville B. Ellis—Executive vice president of the Nickel Cadmium Battery Corp., Easthampton, Mass.

Carrol A. Peterson—Project engineer with the research and development department of Flexible Tubing Corp., Guilford, Conn.

Samuel D. Burks—Assistant manager in the construction specialties division of Dewey and Almy Chemical Co. Mr. Burks was formerly assistant project manager at Folsom Dam, Calif., for the Corps of Engineers.

A. R. Powell—Acting manager of the central research department of Koppers Co., Inc., Pittsburgh, Pa.

Dominick Rosato—Field engineer with Raybestos-Manhattan, Inc. at its U. S. Asbestos Division,

The graphic features a large, dark, diamond-shaped background. At the top, the word "HILCO" is written in large, white, bold, sans-serif capital letters. Below it, the words "provides lower vacuum pump maintenance costs . . ." are written in a smaller, white, sans-serif font. Underneath that, the words "increased vacuum-" are written in a white, cursive script font. In the center of the graphic is a detailed illustration of a Hilco Oil Reclaimer, a mechanical device with various pipes, valves, and a cylindrical tank. To the right of the illustration, there is a white rectangular box with a black border. Inside this box, the words "HILCO OIL RECLAIMER" are written in bold, black, sans-serif capital letters. Below this box, the text "purifies vacuum pump oil by continuous recirculation, either on a full-flow or by-pass basis, or intermittently on a batch basis, depending upon the requirements and physical layout of your plant." is written in a smaller, black, sans-serif font. Below the illustration of the reclaimer, the words "OIL RECLAIMER" are written in a small, black, sans-serif font.

HILCO OIL RECLAIMER SYSTEMS are the finest available for **VACUUM PUMP** users

A simple, economical and efficient method of restoring contaminated lubricating and sealing oil to the full value of new oil. HILCO Oil Reclaimers are used for the purification of vacuum pump oil in conjunction with the manufacture of transformers, condensers, capacitors, drugs, vitamin concentrates, radio tubes and light bulbs, essential oils, optical lenses, refrigeration compressors, titanium and many other products. A HILCO will produce and maintain oil free of all solids, sludge, acid, moisture, solvents, and dissolved gasses and restore viscosity, dielectric strength and other specifications to new oil value.

**THERE IS A HILCO
FOR EVERY OIL PUR-
IFICATION JOB . . .
AND EACH OFFERS
YOU**

These Features!

- Continuous, all electric, automatic operation.
- Low operating temperature.
- Vacuum processing.
- Infrequent operation—low operating costs.

WRITE TODAY!

**For Complete Details
Ask For Bulletin R-160**

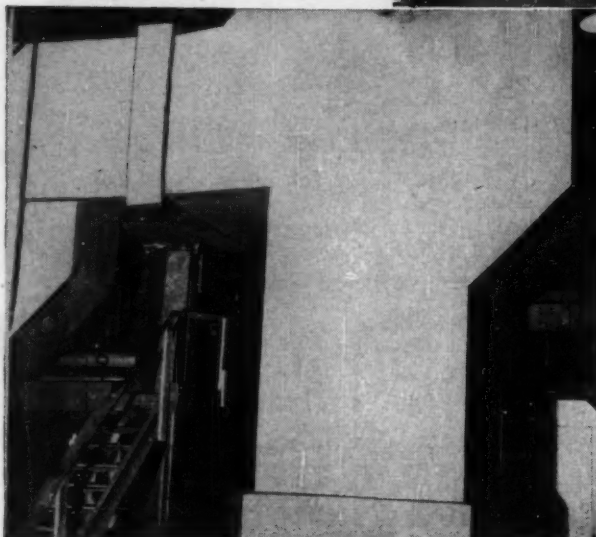
THE HILLIARD Corporation

131 WEST FOURTH ST. ELMIRA, N. Y.

IN CANADA: Upton-Bradeen-James Ltd., 890 Yonge St., Toronto; 3464 Park Ave., Montreal



looking in *Chemical Engineering* for ideas?



insulated
with **BH**
Mono-Block
finished
with **BH**
**POWERHOUSE
CEMENT**

BALDWIN-HILL

POWERHOUSE CEMENT.....

INSULATES AND FINISHES

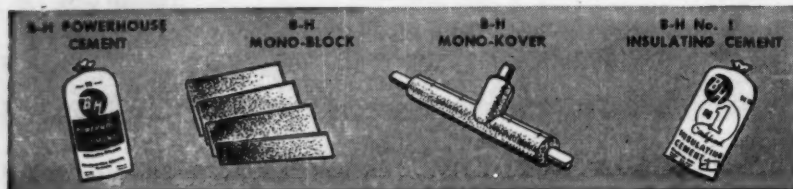


- BH** Easy trowelling...Single coat...Low applied cost.
- BH** Quick hydraulic setting...No drying-shrinkage cracks.
- BH** Weatherproof, "rain-proof" within two hours.
- BH** Smooth surface for oil and water-base paints.

**Baldwin-Hill
COMPANY**

1502 BREUNIG AVE., TRENTON, N. J.
Kalamazoo, Mich. • Huntington, Ind. • Temple, Tex.

Send for bulletin with data on composition, properties, efficiency and low applied cost.



NAMES . . .

Manheim, Pa. Mr. Rosato will work on the development of asbestos base laminates.

William R. Perdue, Jr.—Director, vice president and treasurer of the Ethyl Corp.



Herbert B. Gausebeck

Mr. Gausebeck, associate manager of Armour Research Foundation's chemistry and chemical engineering research department since 1953, has been promoted to manager for program development. In his new capacity he will direct the organization's research promotional activities.

John A. Morgan—Appointed to the newly-created post of executive vice president, Butler Manufacturing Co., Kansas City, Mo. **Walter L. Smith** was elected vice president in charge of engineering and production.

Jefferson C. Falkner—Engineering and customer consultant for Copes-Vulcan Division, Continental Foundry & Machine Co., Erie, Pa.

Fred A. Manske—Executive vice president of National Gypsum Co., Buffalo, N. Y. **Wells F. Anderson** replaces Mr. Manske as vice president in charge of operations and manufacturing.

Robert H. Cornwell—Director of production for National Distillers Products Corp. **Stuart Schott** has been named director of research and **Lee A. Keane** has been

named director of chemical sales. All three appointments are part of a program to integrate all the corporation's chemical activities into one division.

William T. Wood—General director of textile fibers department's manufacturing divisions, E. I. du Pont de Nemours & Co. Mr. Wood succeeds **David H. Dawson**, now assistant general manager of the department.

Lawrence R. Hafstad—Resigned as director of the AEC's division of reactor development to become atomic energy consultant to the Chase National Bank of New York.

Ernest Cochran—President and general manager of The Chapman Valve Manufacturing Co., succeeding **John J. Duggan**, recently deceased.

Alexander Kidd—Vice president of Stewart-Warner Corp., Chicago, Ill. Mr. Kidd was formerly vice president of The M. W. Kellogg Co., New York.

J. A. Ackermann—Chief engineer of The Elwell-Parker Electric Co., Cleveland, Ohio, manufacturer of power industrial trucks.

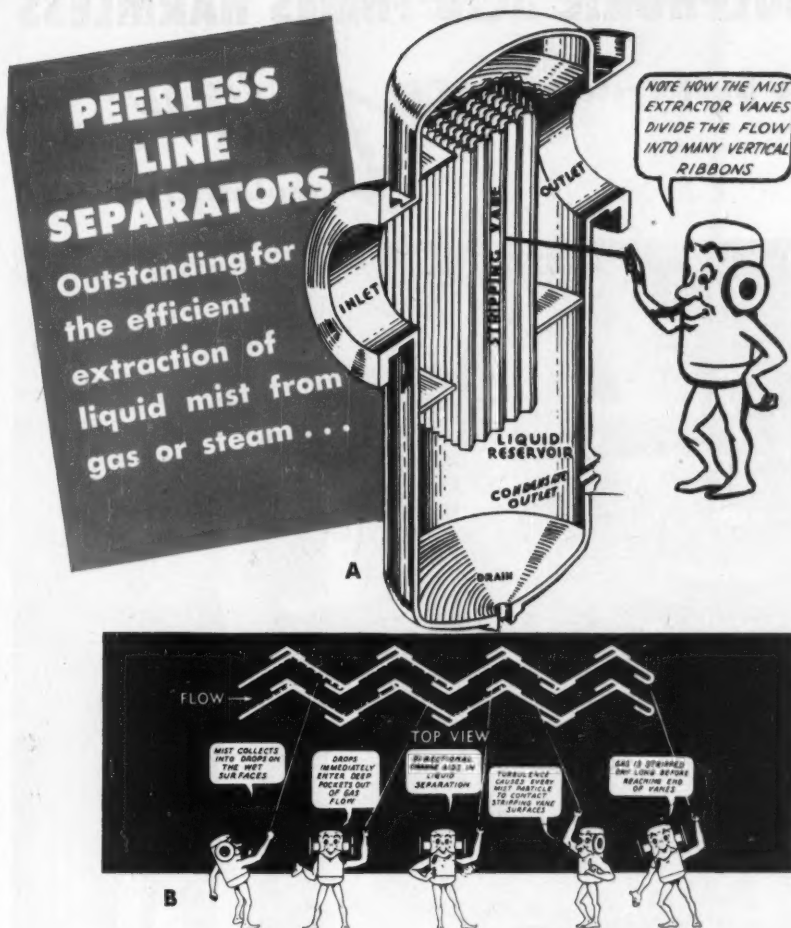
Edwin Verecke—Executive vice president of Heil Process Equipment Corp., Cleveland, Ohio.

Hjalmar A. Anderson—Chief project engineer of Lindberg Industrial Corp., Chicago, Ill.

Martin Batiuk—Technical section manager of the reinforced plastic products department, B. F. Goodrich Co.'s industrial products division.

C. Wesley Tyson—Head of the new petroleum development division of Standard Oil Development Co. **Harold W. Scheeline** is head of the company's new chemicals development division.

Lyle C. Jenness—Chairman of the chemical engineering committee



HIGH EFFICIENCY—HIGH CAPACITY LOW PRESSURE DROP

Thousands of installations throughout the Refining and Chemical industry have proven the Peerless Line Separator principle to be one of the most outstanding methods available for the extraction of liquid from gas, steam or air.

Drawing A above shows the arrangement of the vanes in the Separator. Drawing B is an illustration of the Peerless principle.

The mist extractor combines the forces of impingement, centrifugal motion and surface tension to obtain its high efficiency. The path of the gas, etc., through the unit is constantly bending, causing semi-violent turbulence and rolling of the gas against the walls of the vane. Impingement and centrifugal force combine to contact the droplets with the vanes, where they coalesce, and surface tension then causes them to cling to the vanes' surfaces. Gravity and the impact of the gas stream then drives the droplets into the pockets where they roll down the vanes and out of the gas stream.

Through the Peerless method of mist extraction, the gas is stripped dry long before reaching the end of the vanes.



FOR FURTHER INFORMATION ON THE USE OF PEERLESS LINE SEPARATORS PLEASE WRITE FOR NAME OF NEAREST PEERLESS ENGINEER.

PEERLESS MANUFACTURING CO.

P. O. BOX 13165 ★ DALLAS 20, TEXAS ★ Dixon 8431
REPRESENTATIVES IN ALL PRINCIPAL CITIES

there's A PEERLESS SEPARATOR FOR EVERY REQUIREMENT

For any capacity
For any working pressure
For corrosive conditions
With removable vane units
With extra body length
With connections for accessory equipment
For pressure drop requirements of less than 6" water
For any vapor-liquid ratio
For any piping requirement
SPECIAL DESIGN SEPARATORS FOR ANY REQUIREMENT

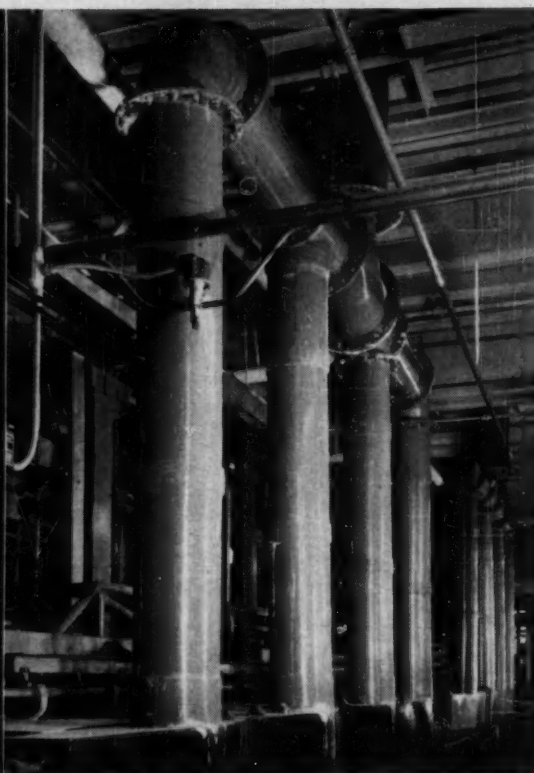


SULPHURIC ACID FUMES HARMLESS

to Duct System made of

Boltaron
6200
unplasticized PVC

"We have done no maintenance since it was installed 16 months ago," says Dexter Lock Company, "We are well satisfied."



DEXTER LOCK'S HUGE RISERS of Boltaron 6200 are shown off the anodizing tanks, going up and through the roof where other Boltaron ducts carry fumes into exhaust fan. "We are well satisfied with the Boltaron 6200 duct system and the service we have received from the Boltaron Fabricator, Carpart Corp., Owosso, Michigan" reported the Company spokesman.

GRAND RAPIDS, MICH.—Boltaron 6200 has done it again. The awesome problem of handling sulphuric acid fumes for months — *perhaps years* — without maintenance, replacement or costly shutdowns has been solved at Dexter Lock Company, a subsidiary of National Brass Company. The answer was *and is* Boltaron 6200.

Highly versatile and readily adapted to complicated shapes, Boltaron 6200 has chemical resistance to both strong and weak organic and inorganic acids, alkalis, alcohol and foodstuffs. It is non-metallic and only half the weight of aluminum. Available in sheet, pipe (and fittings), rod and block stock, Boltaron can be drawn, formed, molded, machined and hot air welded.

Whatever your problem, experienced engineers and fabricators coast to coast and in Canada are ready to help you. Write Box 108 for complete information.

H. N. HARTWELL & SON, INC.

Industrial Plastics Division, Park Square Bldg., Boston, Massachusetts

NEED EXTRA IMPACT STRENGTH? Ask about Boltaron 7200.

NAMES . . .

of the Technical Association of Pulp and Paper Industries (TAPPI). Prof. Jenness is head of the chemical engineering department at the University of Maine.



Nevin K. Hiester

Dr. Hiester, a member of the Stanford Research Institute staff since 1949, has been appointed manager of SRI's chemical and metallurgical engineering section. During his five years at the Institute he has led research programs on ion exchange, food processing, industrial hygiene, fluid flow and heat transfer. Dr. Hiester is co-author of the ion exchange report appearing in *Chemical Engineering* (October '54).

Gustav Schwab, Jr.—Manager of the Marietta, Ohio pipe fabrication plant, Dravo Corp.'s machinery division.

Simon Askin—President and a director of Nuodex Products Co., Inc., manufacturers of chemical additives. Mr. Askin, president of Heyden Chemical Corp., also was elected chairman of the board of Nuodex International, a wholly owned subsidiary. Nuodex's entire common stock was acquired by Heyden Chemical on November 1.

Glen D. Bagley—Recipient of the third Annual Professional Achievement Award of the Western New York Section, American Institute of Chemical Engineers.



Arthur Linz

After almost 20 years with the Climax Molybdenum Co., Arthur Linz has resigned to open his own technical consulting practice in New York City. The former vice president of Climax is well known in the fields of dyestuffs, pigments, chromium, molybdenum, titanium, tungsten, uranium and vanadium compounds. And his consulting work will cover all these fields.

Russell B. Waddell—Works manager of the chemical division of Harris-Seybold Co., Cleveland, Ohio. Mr. Waddell, formerly chemical product development engineer, will have charge of manufacturing, quality control and engineering development at the company's lithographic chemical plant.

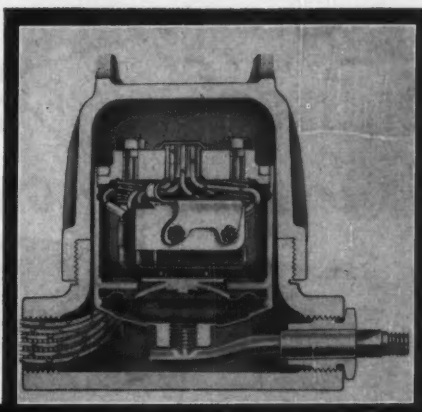
William Bellano—Production manager of the phosphate chemicals division of International Minerals & Chemical Corp., with headquarters in Florida.

G. R. Shockley—Manager of chemical process development in the research department of Olin Mathieson Chemical Corp., New Haven, Conn.

Herman N. Woebecke—Chief engineer of Mobay Chemical Co., St. Louis, Mo.

Stephen L. Tyler—After 17 years, retired as secretary and executive secretary of the American Institute of Chemical Engineers. As of January 1, Mr. Tyler became

New Improved

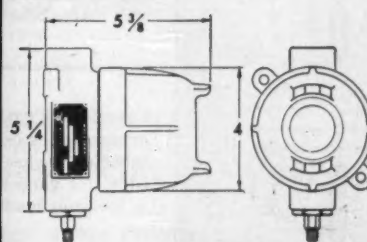


MELETRON PRESSURE SWITCH *for Explosive Atmospheres*

- **LOW COST**
because of design simplicity
- **SMALL and COMPACT**
for easy installation
- **EXTREME ACCURACY**
moving and wearing parts are eliminated
- **NOT AFFECTED BY VIBRATION**
no liquid switching elements are used
- **RUGGED and WEATHER RESISTANT**
enclosed in a crouse-hinds case
- **EASILY ADJUSTABLE**
by convenient adjusting nut
- **OPERATES IN ANY POSITION**
saves installation time



ACTUAL SIZE



LIST PRICE \$46.20

BARKSDALE VALVES

PRESSURE SWITCH DIVISION

5125 Alcoa Avenue, Los Angeles 58, California

send FREE operating and engineering data sheets 920-25

NAME _____ TITLE _____

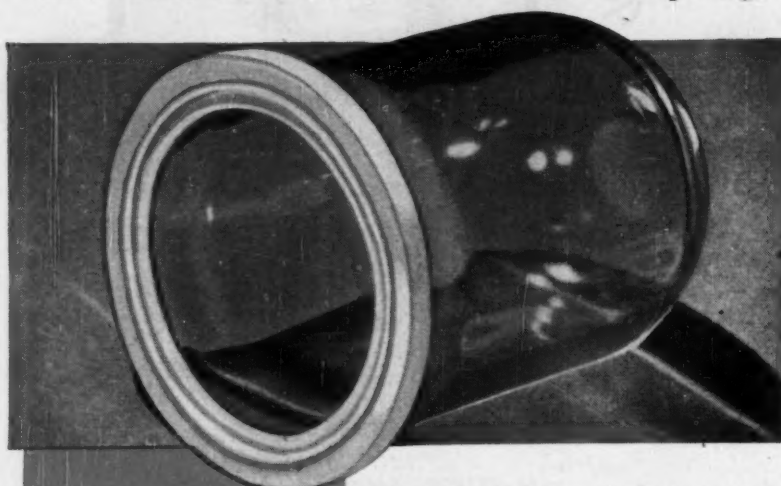
COMPANY _____

ADDRESS _____

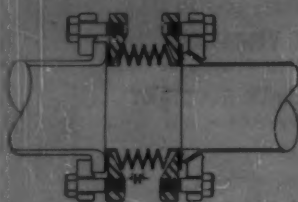
CITY _____ ZONE _____ STATE _____

Chemiseal Gaskets

and Accessories for Glass Piping



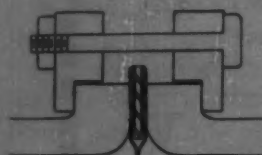
ABOVE: Chemiseal Snap-on Gaskets, molded of TEFLON to match contour of conical end glass pipe, assure perfect automatic centering of joints and free flow of materials. For all standard pipe sizes from $\frac{1}{4}$ in. to 6 in.



AT LEFT: Chemiseal Expansion Joints and Flexible Couplings absorb shock and vibration, thermal expansion and contraction. Correct misalignment. Connect unlike piping ends and nozzles.



Chemiseal TEFLON-Jacketed Gaskets, standard for Corning conical flanges. Seal at low bolt loads. Sizes from 1 in. to 6 in.



Chemiseal TEFLON-Jacketed Gaskets. Compressed asbestos sandwiched between woven asbestos inclosed in a TEFLON envelope. Ideal for glass-lined steel connections. Seal at low bolt loads.



Chemiseal Adaptors provide a safe, tight seal between unlike piping ends and nozzles. A steel bearing ring provides rigidity. Resilient core assures positive seal. TEFLON Jacket protects and contains easy-to-handle single unit.

WRITE FOR CATALOG NO. TG-953.

UNITED STATES GASKET COMPANY • CAMDEN 1, NEW JERSEY

USG

FABRICATORS OF
FLUOROCARBONS & OTHER PLASTICS
Representatives in principal
cities throughout the world



NAMES . . .

secretary of the Committee on Education of the Engineers' Council for Professional Development, a conference of engineering societies active in the promotion of engineering as a career and advancing the professional status of engineers. **F. J. Van Antwerpen** succeeds Mr. Tyler as secretary and executive secretary of the Institute.



John A. Field

Mr. Field has been appointed vice president of Carbide and Carbon Chemical Co., a division of Union Carbide and Carbon Corp. In his new position he will be responsible for sales development and related activities, including the company's fellowships at Mellon Institute, Pittsburgh.

Edwin R. Gilliland—Received the A.I.Ch.E.'s William H. Walker Award at the institute's annual meeting in New York City in December. Prof. Gilliland is a member of the chemical engineering staff at M.I.T.

Barnett F. Dodge—President of the American Institute of Chemical Engineers. Dr. Dodge is head of the department of chemical engineering at Yale University.

Roy Dehn—Director of engineering for The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Raymond W. Keller—Staff production manager, plant food division, International Minerals & Chemical Corp., Chicago, Ill.

Callaway Brown—Recipient of award for scientific merit given by Armour Research Foundation's chemistry and chemical engineering research department. Dr. Brown received the award for research on the manometric determination of liquid ozone's density.

Ernest H. Volwiler—Named to receive the Industrial Research Institute Medal for 1955. Dr. Volwiler is president and general manager of Abbott Laboratories, North Chicago, Ill.

Bert H. McGill—President and general manager of Eclipse Fuel Engineering Co. of Canada, Ltd., Toronto, Ont.

Edward J. Goett—Director and vice president in charge of chemicals, Darco and commercial development departments, Atlas Powder Co., Wilmington, Del.

Joseph B. Infererra—Executive engineer at Worthington Corp.'s Wellsville, N. Y. plant.

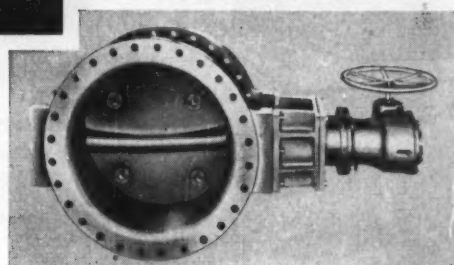
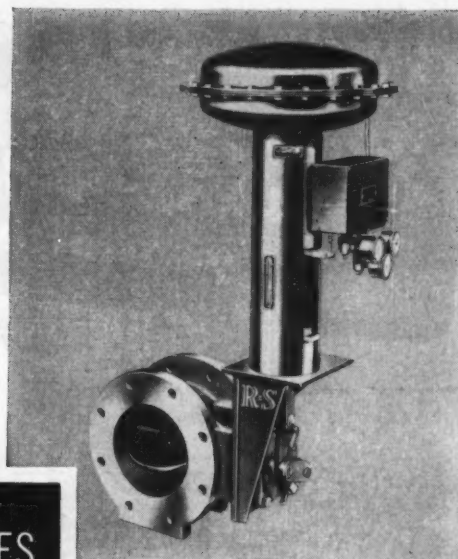
OBITUARIES

Hubert L. Rawlins, Jr., 24, chemical engineer for Shell Oil Co., Houston, Tex., died November 16 at the Weeks Island (La.) field.

Ray E. Miller, advisor to the petroleum chemicals division of the organic chemicals department, E. I. du Pont de Nemours & Co., died November 17 in Doctors Hospital, New York.

Howard G. Dodge, head of the west coast testing station of Underwriters' Laboratories, Inc., died November 20 at his home in Burlingame, Calif. Mr. Dodge was 48 years old.

William H. Henson, special representative of the refractory division, Norton Co., died December 1 in Worcester, Mass. Mr. Henson served as representative on Norton products for use in atomic energy.



R-S VALVES ASSURE ACCURACY, SPEED AND ECONOMY

Automatic or manual—whichever you choose—the S. Morgan Smith R-S Valve line meets these three challenges to valve performance.

UNIFORM CONTROL IN ALL POSITIONS...

R-S Valves give consistent control of flow through all positions in its normal regulating range. The disc simulates a straight line, semi-log quality.

REGULATION AND CLOSURE ARE QUICK...

R-S manual valves are actuated by a lever, chain lever, handwheel or chain handwheel. Power actuation can be provided if desired.

MINIMUM PRESSURE DROP SAVES POWER...

The bevelled disc of the R-S Valve seats solidly with a metal-to-metal seat. Accurate machining and a 9° to 12½° angle of closing insure minimum clearance for minimum leakage. Drip-tight or bubble-tight closure can be obtained with the positive action of a rubber seat valve.

Over 75 years experience in hydraulic design and engineering stands behind valves. For further information about butterfly, cone or ball valves for use in the process fields, see your instrument maker or write to S. Morgan Smith Company, York, Pennsylvania.

HYDRAULIC
TURBINES
PUMPS

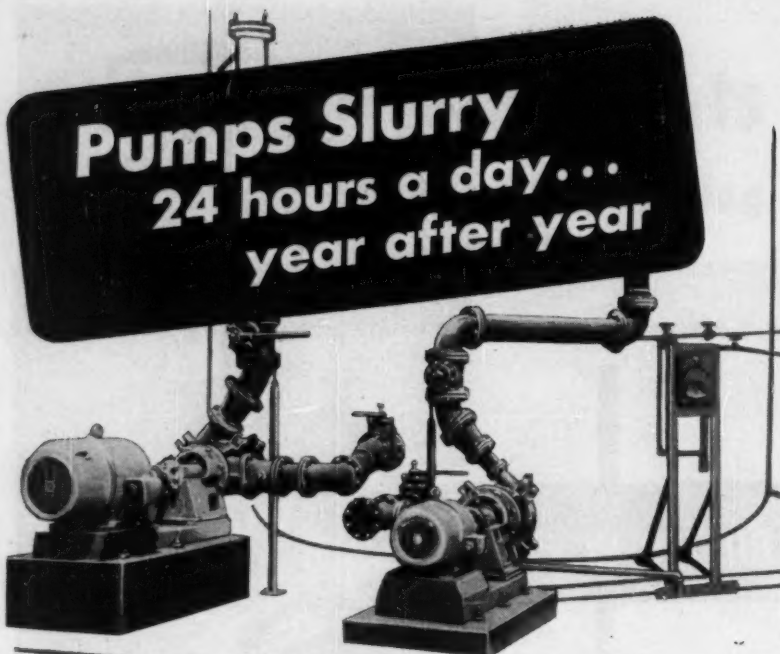
GATES & HOISTS
TRASH RAKES
ACCESSORIES

HYDRODYNAMICS

ROTOVALVES
BALL VALVES
BUTTERFLY
VALVES

FREE DISCHARGE
VALVES
CONTROLLABLE-
PITCH SHIP
PROPELLERS

S. MORGAN SMITH CO.



● MORRIS TYPE R SLURRY PUMP at the left is on continuous 24-hr. duty delivering 1000 GPM of a 170° lime slurry at 100' head. Fifty-HP motor operates at 1180 RPM. Intermittent-duty pump at right delivers 200 GPM at 50' head with 7½-HP motor turning at 880 RPM.

In slurry-handling operations, "long-term service" is a meaningless claim unless the pump will work day-in and day-out with a minimum of maintenance time, trouble and expense

Morris Type R Slurry Pumps—with an established reputation for longer life—also incorporate in their design exclusive features which result in easier installation . . . fewer interruptions to service...less overhaul...fewer replacements.

To provide uninterrupted service . . .

The gland is under suction pressure only. This reduces leakage and dilution . . . keeps harsh abrasives out of the stuffing box . . . practically eliminates packing troubles.

There are no internal studs or bolts. Caustic and corrosive solutions cannot seep past threads and cause maintenance headaches.

To make installation and dismantling easy . . .

Shell is interchangeable for right or left hand rotation. Suction and discharge nozzles can be rotated around the axis of the pump to a total of 72 different locations.

Impeller removed without disturbing the piping. You simply loosen 4 outside clamping bolts and pull off the end cover. This feature alone saves considerable time and labor.

● **Free Service.** Morris Engineers will be glad to recommend the pump best suited to your needs for size, capacity, etc. Send necessary data today . . . include request for Bulletin 181.

MORRIS MACHINE WORKS

Baldwinsville, N. Y.
Sales Offices in Principal Cities

MORRIS Centrifugal Pumps

THIS MONTH'S

Technical

Most Complete

PLASTICS ENGINEERING
HANDBOOK. Reinhold Pub-
lishing Corp., New York.
813 pages. \$15.

The greatly expanded edition of this SPI (Society of the Plastics Industry) Handbook is probably the most complete compilation of engineering knowledge to be published on the design, materials and processing of plastic products. The original SPI handbook published in 1947 is about half the size.

Completely new chapters have been added such as the chapter on Tooling With Plastics. Another important innovation is the fold-out adhesives chart. This chart is a most complete tabulation of the types and characteristics of adhesives used to join plastics to each other or to other materials.

Twenty chapters comprise five major sections: materials and processes, design, finishing and assembly, testing, and SPI standards.
—MMH

Expanded 25%

CONVEYORS AND RELATED
EQUIPMENT. 3rd edition.
By Wilbur G. Hudson.
John Wiley & Sons, New
York. 524 pages. \$9.

Here is a book that will provide you with the general information necessary to intelligently weigh the recommendations of manufacturers when you have the problem of selecting the equipment best suited for a given job.

Salient features of the various equipment types are reviewed along with the advantages and disadvantages of each type. Where possible, comparative costs are indicated. Handling characteristics of a number of common solids are given.

Equipment covered includes screw conveyors; flight and apron conveyors; continuous-flow conveyor; pneumatic and hydraulic conveyors; belt conveyors; aerial

Bookshelf

L. B. Pope

tramways; storage and transport equipment; bins and bunkers; crushers, hammer mills, and pulverizers; screens, feeders, and gates; car unloading equipment; weighing equipment; chains, drives, drive groups, motors; power-plant coal and ash handling equipment.

Considerations common to the selection of all types such as the prevention of dust explosions and price vs. quality are given in the chapter on general principles.

This third edition is expanded about 25% over the previous edition. The new material includes belt construction and dynamatic drive control; 1954 costs and designs of silos, bins, and bunkers; developments in pneumatic handling; hydraulic transportation of coal in pipelines; and recent expansions in fork truck applications using 2-way radio.—MMH

Techniques

QUALITY CONTROL. 2nd Edition. By N. L. Enrick. The Industrial Press, New York, N. Y. 181 pages. \$4.

Reviewed by J. K. Borland

This treatment of quality control makes a conscious effort to avoid mathematics which might be onerous to inspectors. The techniques discussed include sampling inspection, control charts for attributes and variables, significance tests and analysis of variance. The chapter on analysis of variance is not a complete exposition, but it may serve to whet the appetites of prospective users.

Because the concepts of statistical quality control are relatively new in industry, it is often difficult to gain acceptance of the methods by supervisory and management people. There is valuable discussion of this problem and management aspects of quality control. An interesting and instructive case history is given in considerable detail.

Although there is some question

Helicoid Chemical Gage

Gages for corrosive chemicals and liquids up to 5000 p.s.i.

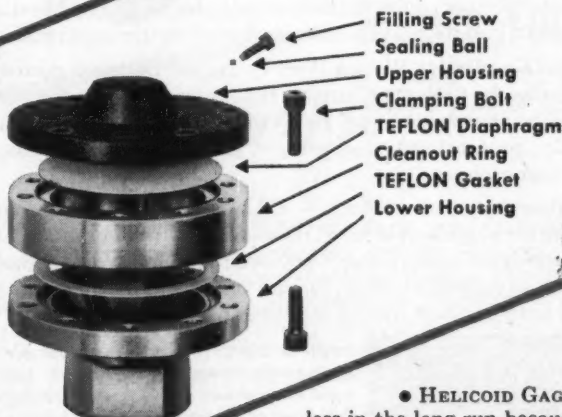


• Here's an accurate pressure gage for chemicals and other viscous liquids which might corrode or clog the Bourdon Tube. It registers working pressures from 30" vacuum to 5000 p.s.i. and temperatures to 400°F.

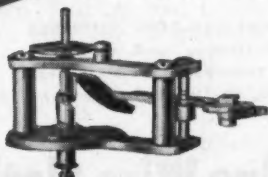
Guaranteed accuracy plus or minus 1%.

A single diaphragm seals off objectionable substances from the indicating gage. This gage is filled completely with specific inert liquids and pressure is transmitted directly to the indicating gage through deflection of the sealing diaphragm.

FEATURES



• **HELICOID GAGES** cost less in the long run because they give long, trouble-free service with a minimum of maintenance. The movement is a simple cam and roller design that does not have any gear teeth to wear out. It has been tested and proved in years of hard service.



Only Helicoid Pressure Gages
Have the Helicoid Movement

Write for Catalog Today

ACCO

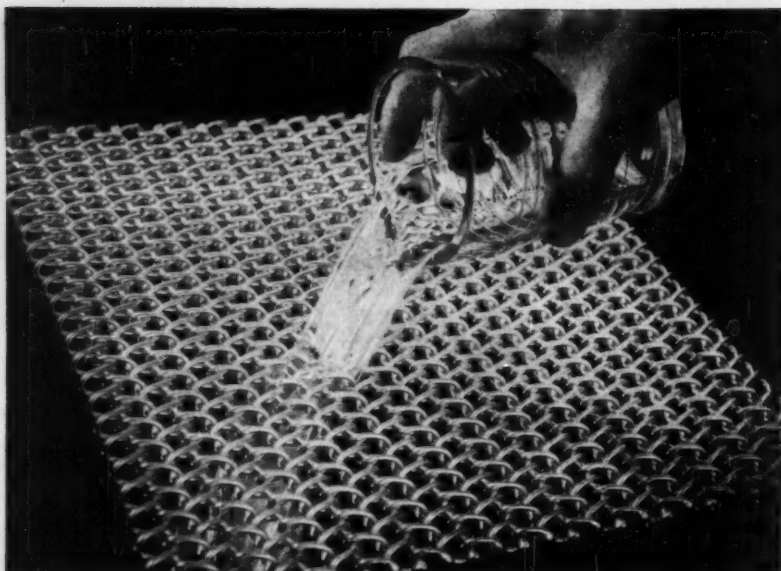


Helicoid Gage Division

AMERICAN CHAIN & CABLE

927 Connecticut Avenue • Bridgeport 2, Connecticut





OPEN MESH!

Cambridge

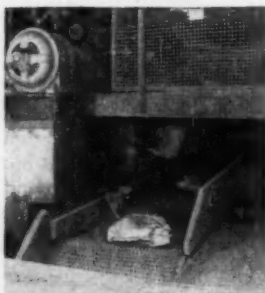
WOVEN WIRE CONVEYOR BELTS

provide continuous, low-cost processing and handling

Open mesh construction lets heat and gases circulate freely, cannot trap liquids or spilled solids . . . provides uniform washing, draining, drying and waste-free packaging at controlled rates of speed. Moving belt eliminates batch handling, cuts costs, provides continuous production.

All-metal Cambridge Woven Wire Conveyor Belts are corrosion resistant and impervious to damage from constant operation at temperatures up to 2100° F . . . have no seams, lacers or fasteners to snag packages or wear unevenly, no localized weakening. Open mesh permits easy salvage of spilled materials.

No matter how you look at it, CAMBRIDGE Woven Wire Conveyor Belts are invaluable aids to AUTOMATION . . . eliminate profit-stealing batch and hand operations. They are made in any size, mesh or weave, and from any metal or alloy. Special raised edges or cross-mounted flights to hold your product during movement are available.



BAGGED CEMENT . . . Spillage sifts through open mesh of belt — salvaged as bagged product moves on its way with minimum handling.

Call in your Cambridge Field Engineer to discuss how you can cut processing costs by continuous operation. You can rely on his advice. Write direct or look under "BELTING, Mechanical" in your classified telephone book.

ASK FOR FREE 130-PAGE REFERENCE MANUAL illustrating and describing woven wire conveyor belts. Gives mesh specifications, design information and metallurgical data.



The Cambridge Wire Cloth Co.

WIRE
CLOTH

METAL
CONVEYOR
BELTS

SPECIAL
METAL
FABRICATIONS

Department G

Cambridge 2, Maryland

OFFICES IN LEADING INDUSTRIAL AREAS

BOOKS . . .

about how "non-mathematical" one can get on this subject, it is felt that the book would serve as a satisfactory introduction to quality control for mechanical parts and textile inspectors. The book would be of limited value to chemical engineers or chemists.

Valuable Round-Up

SUCCESSFUL COMMERCIAL CHEMICAL DEVELOPMENT. Edited by H. M. Corley, John Wiley & Sons, New York. 362 pages. \$7.75
Reviewed by Richard F. Warren

Here is a round-up of important factors that influence the selection and development of promising new chemicals. Result of a group effort by the Commercial Chemical Development Association, it is a valuable addition to technical literature.

The book describes development of chemicals up to the stage where they make an important contribution to the company's profit. It also points out pitfalls to be avoided in any commercial chemical development effort.

In addition to spelling the need, growth, results, and objectives of commercial chemical development, it deals with the commercial growth of the chemical industry and definitions of the terms employed in any discussion of chemical development.

Several chapters deal with the place of commercial chemical development in industrial chemical enterprise. In fact, one chapter is devoted to discussing management of this phase of the chemical business.

Techniques of commercial chemical development at each stage in the growth from test tube to tank car are discussed in detail in 12 separate chapters. Included are descriptions of interim objectives to be achieved at various stages of development. Techniques used in deciding on sampling programs, pricing and trade names are also indicated.

Product labeling, packaging and

shipping considerations are also discussed in a separate chapter. Toxicology, safety, and handling problems are explained as a part of the development program.

Included in the book are three case histories of successful new products:

1. 2-ethylhexyl compounds
2. furfural
3. sodium tripolyphosphate

In addition to the successful products, an example of an unsuccessful new product is also cited.

A case history of a chemical which was considered unsuccessful in product development by one firm and is now considered a successful development by another is also shown.

The association uses the final chapter to set forth the qualifications needed if a person is to be successful in commercial chemical development work.

This book is a good reference book for individuals engaged in commercial chemical development or related phases of the chemical industry.

Chemical engineers as well as chemists in research, production, and sales will gain a better understanding of the role this segment of company operations play in providing more and better opportunities for advancement.

It will be a valuable addition to any chemical engineer's bookshelf.

Flow and Transfer

CHEMICAL ENGINEERING.
Vol. I. Fluid Flow, Heat Transfer and Mass Transfer.
By J. M. Coulson and J. F. Richardson. McGraw-Hill Book Co., New York. 372 pages. \$7.50.

Momentum, heat and mass transfer are the underlying mechanisms of many chemical engineering operations. In this text for advanced students, chemical engineering is considered in terms of the fundamental physical mechanisms involved rather than as a series of isolated unit operations.

It has four major sections: Flow of Fluids; Heat Transfer; Mo-

GIVES YOU BEST

Performance

Because it's Best Suited to the Job



WELDCO

Always Meets Your

Specifications

TO GET TOP-QUALITY TUBING made to your individual needs, it's always good business to specify Weldco. For Weldco is produced by tubing specialists—men who have the equipment, facilities and experience to manufacture tubing to your exact specifications. Weldco is automatically machine-welded under pressure, properly formed, carefully finished, accurately sized and straightened, and rigidly checked.

Lightweight and corrosion-resistant, Weldco is available in Monel, Stainless, Inconel, Nickel and other alloys, in sizes from 3½" to 30" O. D., 16 ga. to ¼" wall thickness. To insure top performance and long service life, make Youngstown Welding your tubing headquarters. A letter or phone call puts our 36 years of specialized experience to work for you.

Whatever Your Needs In Tubing . . . You're Way Ahead With WELDCO

THE YOUNGSTOWN WELDING & ENGINEERING CO.
3712 OAKWOOD AVE. . YOUNGSTOWN 9, OHIO

Mass Spectrometry... on a practical industrial basis

Two companion instruments, Types 21-610 and 21-620, now extend the speed and accuracy of mass spectrometric analysis from the laboratory out into the plant. Flexible and simplified, needing only 115 volts and a small supply of cooling water, the twin instruments are easily adaptable to process-stream monitoring, batch work, or leak detection.



For monitoring & controlling streams to ...

For higher resolving power, readings to ...

TYPE 21-610 is moderately priced and a truly general-purpose instrument. Although primarily designed for continuous petroleum and petrochemical stream analysis, it is also valuable as a production-line leak detector or laboratory analytical instrument. It has been used in applications ranging from on-the-spot acetylene-plant monitoring to hospital clinical tests on lungs.

TYPE 21-620 has the highest mass range of any instrument in its compact size range. Using the newly developed "Cycloidal Focusing" principle for analysis, it goes beyond the 21-610 for accurate readings from mass 2 to mass 150. Medical laboratories, petro-chemical plants and general research organizations will all find it an ideal answer to their analytical problems.

Modifications ... accessories



The 21-610 may be converted to a 21-620 whenever the latter's greater resolving power is needed. The work is accomplished by a CEC Field Service Engineer without return of the instrument to the factory. Involving primarily the exchange of some components and the addition of certain others, the conversion is made reasonably and quickly.

An extensive accessory line greatly broadens the utility of both the 21-610 and 21-620. Automatic peak selectors scan as many as six mass numbers on a repetitive cycle; sampling probes and magnet shunts make either instrument a practical production-line leak detector; batch-sample inlet systems and continuous-chart recorders (left) may be mounted directly on the instruments.

How industrial mass spectrometry can be used in *your* business is explained in Bulletin CEC 1824A-X12. Send for your copy.

Consolidated Engineering Corporation

ELECTRONIC INSTRUMENTS FOR MEASUREMENT AND CONTROL
300 North Sierra Madre Villa, Pasadena 15, California

Sales and Service Offices Located in: Albuquerque, Atlanta, Buffalo, Chicago, Dallas, Detroit, New York, Pasadena, Philadelphia, Seattle, Washington, D. C.

BOOKS . . .

mentum, Heat and Mass Transfer; Humidification and Water Cooling. Vol. II, now in preparation, will apply the fundamentals to the various unit operations and the design of commercial equipment.

This book is not for the casual reader. But graduate students, academicians and research chemical engineers will insist that it be ordered for their libraries.

You'll find small print sections in many of the chapters. They are the more theoretical features and can be neglected in a first reading. All of Chapter 9 on boundary layer theory may be omitted by those more concerned with practical utility.

The authors have chosen to include many derivations with more mathematical detail than is customary. This should help students to apply the same analysis to a variety of problems.

A number of worked-out examples are given in several chapters. Problems for assignment are missing. Each chapter has a bibliography of related references for the subject matter covered.—RFF

Mechanics

BERGBAUMECHANIK. By J. Maercks and G. Jungnitz. Fourth edition. 670 pages. Springer Publishers, Berlin.

Reviewed by Max Wulffhoff

The title of this profusely illustrated handbook of applied mechanics understates facts inasmuch as the volume should be exceptionally useful to process equipment designers in general. Although the arrangement of the subject matter follows the classic pattern of subdivision into statics, strength of materials, dynamics of solids, hydrodynamics and fluid flow, the selection of examples is particularly apt and original. One finds timely directions on the computation of belt conveyors, scrapers, elevators, vibratory equipment, rotary piston and other positive-displacement pumps and fluid motors, pneumatic devices, axial and ra-

dial fans, and turbomachinery. Practical applications of the laws of fluid flow are stressed, particularly the calculation and layout of air and gas lines, and fluidization problems. Industrial air-conditioning is discussed in detail, especially for cases involving large quantities to be handled and extremely variable operating conditions.

A set of useful tables concludes the work which forms a serviceable companion volume to existing books on process equipment design.

How to Use

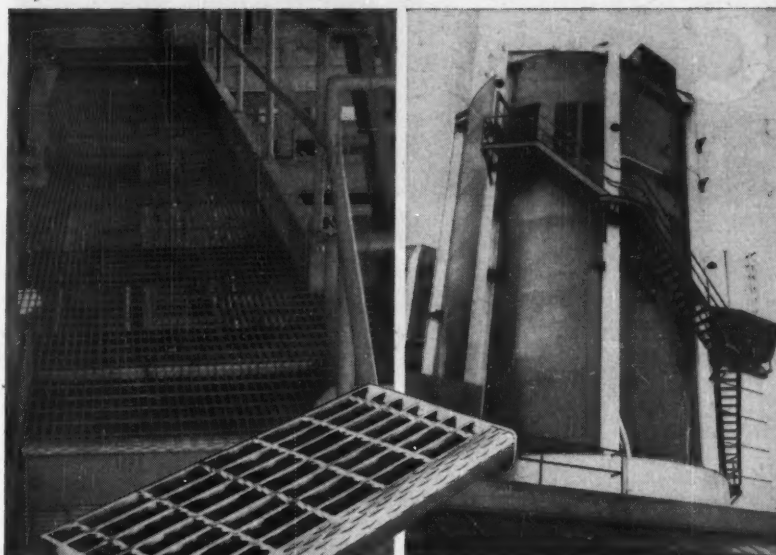
MOLECULAR THEORY OF GASES AND LIQUIDS. By Joseph O. Hirschfelder, Charles F. Curtiss and R. Byron Bird. John Wiley & Sons, New York. 1,219 pages. \$20.

Reviewed by E. J. Lawson

The authors of this volume have written a big book, not only in physical size but, more importantly, in the depth and breadth of treatment of the subject matter. The account is based on the fundamental quantum-mechanical properties of both individual particles and ensembles of particles, and relates these to the behaviour of systems in the various states of aggregation.

Both equilibrium phenomena (equation of state, vapor-liquid equilibrium, and critical state conditions) and non-equilibrium or transport phenomena (viscosity, heat conductivity and diffusion) are fully treated. The derivations of the laws are first given from a simple physical approach and then obtained in as fully rigorous a manner as the present stage of development allows. At the same time, an effort is made to show how the resulting formulas can be used practically by engineers without the necessity for going through the detailed mathematical labor involved in the derivations.

For the engineer who has good basic training in physics and particularly kinetic and statistical-mechanical theory, this book will be



Stair treads by BLAW-KNOX

you can easily make every step a safe step

Indoor or outdoor, you can rely on Blaw-Knox Stair Treads to provide the safety you want in your plant.

Designed for tremendous strength against impact, these stair treads are made with twisted cross bars and rolled diamond checkered plate hosing—as illustrated.

But, when desired, you can get treads with a twisted cross bar nosing or an abrasive nosing. And for specially slippery conditions we can supply you with serrated cross bar treads.

Just tell us what your application is and we'll offer our recommendations as to the best type of tread for your job.

Only Blaw-Knox Electroforged®

Steel Grating and Stair Treads

—have these five exclusive features:



1. rigid one-piece construction—easy to install
2. all surfaces accessible—easy to paint
3. no sharp corners to clog—self-cleaning
4. maximum open area—for light and ventilation
5. non-slip twisted crossbar—safe footing

*A short note will bring you a copy of new Bulletin No. 2365-R
—a dimensional sketch will bring you a quotation.*



BLAW-KNOX COMPANY
2090 Farmers Bank Building • Pittsburgh 22, Pa.

**BLAW-KNOX EQUIPMENT DIVISION
GRATING DEPARTMENT**

GRATING APPLICATIONS: floors • platforms • walkways • catwalks • stair treads • fan guards • shelving • and many other uses, both outdoors and indoors, for versatile steel grating.



the shaft seal for most chemicals



Combining chemically impervious duPont TEFLON with a balanced bellows design—Chemiseal external mechanical seals last longer and give unsurpassed performance under a wide variety of chemical service conditions.

Three years of actual field service handling acids, alcohols, alkalies, hydrocarbons—clear, abrasive and tarry materials—have proven it.

Seal rotates with shaft. Only

bearing surface is between precision ground rotating and stationary faces.

Low friction load on shaft. Lower power cost.

No scoring of shafts. Shafts already scored by other seals or packing can be satisfactorily sealed.

Pressures at the seal up to 100 psi at 75° C or 75 psi at 100° C. Sizes from 1/8" to 2 1/4", maximum length 2 3/4". Other sizes for special applications.

Write for Bulletin No. MS-954.

UNITED STATES GASKET COMPANY
CAMDEN 1, NEW JERSEY

USG

**FABRICATORS OF
FLUOROCARBONS & OTHER PLASTICS**
Representatives in principal
cities throughout the world



BOOKS . . .

an aid in showing him how to make practical use of the latest developments in the field, while also enabling him to understand the present state of fundamental theory.

Plus 2,500

DICTIONARY OF ORGANIC COMPOUNDS. 2nd edition. Edited by Ian Heilbron and H. M. Bunbury with A. H. Cook and E. R. H. Jones. Oxford University Press, New York. 3,031 pages. \$78.

For the physical constants of any organic compound — as they are most authoritatively known today — you are urged to consult Heilbron. As users of the first edition know, the accepted data for thousands of compounds are listed. Formula, molecular weight and references are always given. Other data also, as available: structural formula, appearance, melting and boiling points, index of refraction, density, solubilities, derivatives, data on derivatives and (rarely) uses.

The new four-volume edition adds more than 2,500 principal entries, thus increasing the value of this reference work.

Lacquers

PHYSIKALISCHE UND TECHNOLOGISCHE PRUEFVERFAHREN FUEER LACKE UND IHRE ROHSTOFFE. Edited by Felix Wilborn. 2 volumes. 866 pages. Berliner Union Publishers. DM 165 or \$40.

Reviewed by Max Wulfighoff

In five parts with 175 individual chapters written by international authorities in the field, available methods for testing paints and coatings are presented. The opening chapters deal with the testing of primary materials as oils, resins, bituminous materials, cellulose derivatives, chlorinated rubbers, vinyl and acrylic polymers, plasticizers, pigments. Subsequently, equipment and procedures for testing liquid paints are treated. Ulti-

mately, means for investigating properties and performance of the finished coating are discussed in detail. Among the latter are noted airplane dopes, leather varnishes, bituminous applications, filler compounds and other special products. Photographic techniques are included in a comprehensive review of modern laboratory aids.

Precision and brevity of style have made it possible to cover this vast field in less than 900 pages.

Double Price, Double Value

ATOMIC AND FREE RADICAL REACTIONS. 2 Volumes. By E. W. R. Steacie. Reinhold Publishing Corp., New York. 901 pages. \$28.

Reviewed by F. C. Nachod

The original ACS monograph bearing the same title which appeared first in 1946 has now grown to almost double its original size. The material has been brought up-to-date and literature references up to the year 1954 are included. The first volume is devoted to experimental methods, bond-dissociation energy and free radicals in thermal and photo-chemical reactions. The second volume is mainly concerned with particular systems containing carbon and hydrogen, oxygen, nitrogen, chlorine and fluorine, bromine, iodine, sodium, sulfur and other metals.

Dr. Steacie's authoritative work has already enjoyed an excellent reputation. Now that it is increased in content and size it also has more than doubled in price as well as in value.

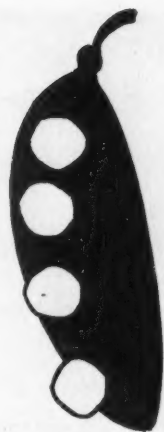
Recent Books Received

Adhesion and Adhesives Fundamentals and Practice. Ed. by Clark, Rutzler & Savage. Wiley. \$9.75.

Chemical Process Principles. Part I. 2nd ed. By O. A. Hougen, K. M. Watson & R. A. Ragatz. Wiley. \$8.50.

Instrumental Methods of Chemical Analysis. By G. W. Ewing. McGraw-Hill. \$6.50.

Mechanism of Polymer Reactions. By G. M. Burnett. Interscience. \$11.



Un-alike as peas in a pod..

Peas in a pod differ in ways, discernible only through close scrutiny . . . and the same can be said about most filtration equipment, both in performance and appearance.

However . . .

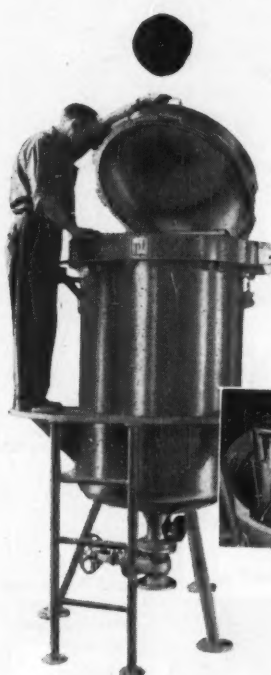
There is filtration equipment that is entirely different . . . PROCESS FILTERS. These filters have features, functionally unique, to produce efficient filtration at low cost. Just a glance at a Process Filter and you immediately associate its features with filtration efficiency, low operating cost and one man operation.

For instance . . .

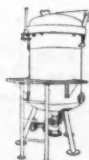
Look at this Model V Process Filter . . . The cover has no bolts, just a handle that releases the cover in a few, quick motions to save 15 to 20 minutes on every opening, permitting frequent inspection to insure maximum filter performance.

The SPEED SLUICE (inset) . . . in combination with the RAPID OPENING COVER gives the operator positive sluicing control. This arrangement allows the operator to watch the cake discharge, minimizing the amount of sluicing liquid used. As a result, reprocessing of slurries are more economical because of higher concentrations with attendant savings in time and power. There are no connections to make or break to open the cover, and complete servicing of the header

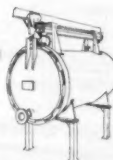
is only a matter of lifting out the attachment. This sluicing device is simple, yet as efficient as any mechanical method.



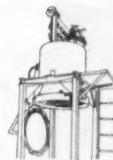
These are only a few of the features you'll find in the complete line of Process Filters . . . some particularly suited to your process . . . ALL designed to give you a better product at lower cost to keep you ahead of competition. You'll be interested in what Process Filters' engineers have for you . . . It will pay you big dividends to find out.



Sluicing



Dry Solids Recovery



Batch Type



Cartridge Polishing

Process Filters, Inc. engineers and builds many types of filtration equipment to meet your particular requirements. For further information, mail this coupon.



PROCESS FILTERS, Inc.
1807 Elmwood Avenue,
Buffalo 7, N. Y.

A subsidiary of Bowser, Inc.



Gentlemen:
Please send me information on the following:

- ☐ Dry Solids Recovery Filters
- ☐ Batch Type Filters
- ☐ Sluicing Filters
- ☐ Cartridge Polishing Filters

Name

Title

Company

Address

CityZone.....State.....



Pressure Kettle
Two-thirds Jacketed
40 to 200 gal.



Style CW Kettle
Two-thirds Jacketed
80 to 300 gal.



Style A Kettle
Two-thirds Jacketed
5 to 300 gal.



Style B Kettle
Full Jacketed
10 to 300 gal.



Vacuum Pan
50 to 500 gal.

*REDUCE YOUR
PROCESSING COSTS*

WITH

LEE

EQUIPMENT

- ✓ **CORROSION-RESISTANT**
Built from time-proved stainless steel
- ✓ **WIDE RANGE OF SIZES**
To fit your exact requirements
- ✓ **INDIVIDUALLY DESIGNED**
To meet your specific processing operation
- ✓ **PRECISION-BUILT**
To give you long years of peak performance
- ✓ **LOW MAINTENANCE**
Easy to clean and keep clean

Our technical bulletins describe this equipment in detail.

Write for them today!

LEE

METAL PRODUCTS CO., Inc.

417 Pine Street, Philipsburg, Pa.

ALL LEE KETTLES ARE MADE TO A.S.M.E. CODE



Style A37 Center-line Scraper Agitator Kettle
25 to 300 gal.



Style C Kettle
Two-thirds Jacketed
5 to 100 gal.



Style CW37 Center-Line Scraper Agitator Kettle
80 to 300 gal.



Mixing Tank
25 to 500 gal.



Pulp Tank
500 to 2,000 gal.



Storage Tank
100 to 5,000 gal.

THIS MONTH'S

Recent Books

Nuclear Geology

There's a rapidly expanding field of knowledge between nuclear physics and geology. This symposium on nuclear phenomena in the earth sciences is the result of an attempt to compile an authoritative text. Fundamentals, elements, exploration, age determinations, fission in nature are some of the topics covered. 414 pages.

"Nuclear Geology." Edited by H. Faul. John Wiley & Sons, 440 Fourth Ave., New York. \$7.

Packaging

A new directory covers makers of all types of packaging machinery. Trade names, equipment, manufacturers.

"Official Packaging Machinery Directory." Packaging Machinery Mfgs. Institute, 342 Madison Ave., New York 17, N. Y. \$10.

Time & Motion

Transcripts of top leaders at a recent conference. Includes time study, motion economy, wage incentives, job evaluation, plant layout, cost controls and human relations. 176 pages.

"Proceedings of the 18th Annual National Time and Motion Study and Management Clinic." Industrial Management Society, 35 East Wacker Drive, Chicago 1, Ill. \$5.

Southern Survey

An index to manufacturers of soaps, cleaners, polishes and related compounds in the 14 southern states from Maryland to Texas. 16 pages.

"Southern Chemical Industry Survey. Part II." Southern Association of Science and Industry, 5009 Peachtree Road, Atlanta, Ga. \$1.50.

New Law

A report on the new atomic energy law and what it means to

& Pamphlets

industry. These papers from a recent meeting cover interpretations of the law, investment problems, labor outlook, insurance problems. 181 pages.

"The New Atomic Energy Law—What It Means to Industry." Atomic Energy Forum, 260 Madison Ave., New York 16, N. Y. \$5.

Hardnesses

The Moh hardness scale can be correlated to rebound hardness. Rebound hardness can be expressed in terms of energy consumed. There probably exists an absolute hardness scale expressible in terms of work per unit volume of deformation. 23 pages.

"Shore Scleroscope Hardness Tests Made on Mohs' Scale Minerals From Talc to Quartz, Inclusive." By B. W. Gilbert. Department of Mining and Metallurgical Engineering, University of Illinois, Urbana, Ill.

Quality Control

Even the smallest processor or manufacturer should take a look at quality control and research. SAMA helps to answer the questions of executives who want to make a success of transition to scientific quality control. 24 pages.

"Quality Control and Research—Insure Your Product in Tomorrow's Market." Scientific Apparatus Makers Assn., 20 North Wacker Drive, Chicago 6, Ill. 25¢.

Faculties

Chemical engineering schools, addresses, faculties, accredited status and other data of interest to company personnel representatives. 37 pages.

"Chemical Engineering Faculties of Canada and the United States for 1954-55." American Institute of Chemical Engineers, 25 W. 45 St., New York 36, N. Y.



for the preparation of New Chemical Products



Quaker Oats' THFA (tetrahydrofurfuryl alcohol) is a convenient starting point for the preparation of high boiling esters and ethers where its function is that of a primary alcohol. The esters are useful commercially as plasticizers and weed killers.

The reactions of THFA as a cyclic ether are of increasing importance. Such reactions include: (A) ring cleavage to yield open chain compounds, such as pentanetriol; (B) cleavage and subsequent cyclization to 2,3-dihydropyran; (C) cleavage and cyclization to pyridine. Intermediates produced from THFA are useful in the synthesis of lysine, glutaric acid and other products of potential importance.

THFA is readily available in commercial quantities; two grades are offered in cans, drums, and tank cars.

PROPERTIES (PURE COMPOUND)

Bolling point, °C. 747 mm.	177.8
Specific gravity, 20/20	1.054
Refractive index, n 20/D	1.452
Water solubility	complete

Send for a sample of tetrahydrofurfuryl alcohol and further information about the product. (Bulletin 87 C).

*Reg. U. S. Pat. Off.

The Quaker Oats Company
CHEMICALS DEPT.

335X The Merchandise Mart, Chicago 54, Illinois
Room 535X, 120 Wall St., New York 5, N. Y.
Room 435X, P. O. Box 4376, Portland 8, Oregon

In Europe: Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands;
Quaker Oats (France) S. A., 3, Rue Pillel-Will, Paris IX, France
In Australia: Swift & Company, Pty., Ltd., Sydney
In Japan: F. Kanematsu & Co., Ltd., Tokyo



you get custom-made results with factory-made hangers and eliminators

Each is a complete packaged unit, designed to serve a particular purpose.

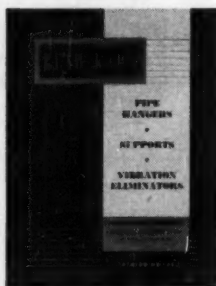
So when you use our functional spring hangers . . . which have the Blaw-Knox patented *internal swivel action* . . . and our constant support spring hangers and vibration eliminators, you get custom-made results. And that holds good for rigid hanger assemblies and overhead roller assemblies.

Proper selection cuts your engineering time and expense . . . yet enables you to meet the most exacting standards. Each is ready to install, so you eliminate expensive cutting, threading and assembling in the field.

Our engineers, who have solved many tough hanger and piping vibration problems, are always available to both design and make recommendations for your hanger requirements.

BLAW-KNOX COMPANY

Power Piping and Sprinkler Division
Pittsburgh 33, Pennsylvania



For more information
on our complete line,
write for your copy of
Bulletin No. 54.

BLAW-KNOX

PIPE HANGERS

Complete line of functional spring hangers • constant support spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated piping systems for all pressures and temperatures

THIS MONTH'S

Firms in

New Names

Dorr-Oliver Inc., Stamford, Conn., is the new name of the Dorr Co., Stamford, since its merger with Oliver United Filters Inc., Oakland, Calif.

Southwest Industrial Sales Co., Dallas, Tex., is the new name of Size Control Co.

American Society of Heating & Ventilating Engineers will now be known as the American Society of Heating & Air-Conditioning Engineers, Inc.

ACEC Electric Corp., New York, is the new corporate name for the Belgian Electric Sales Corp.

"Taslan" is the trade name given to Du Pont's textured yarns made by the new bulking process.

Farnow, Inc., is the new corporate name of Farnow Varnish Works.

E. L. Courmand & Co., Inc., Havre de Grace, Md., structural plastics fabricator, has changed its corporate name to Luria-Courmand, Inc.

New Companies

Amm-o-gro Div. of Specialty Oil Products, Brea Chemicals, Inc., has been established to handle the firm's anhydrous ammonia.

Ortho Agricultural Chemicals Ltd. has been organized as a Canadian subsidiary of California Spray-Chemical Corp. in British Columbia.

New Representatives

Cleaver-Brooks Co. has appointed Rex Bircket & Co., Tulsa, Okla., as manufacturer's representative for its boiler equipment.

Hungerford & Terry, Inc., has named Du-Bois-Webb Co., Detroit, as Michigan representative.

the News

M. A. Gibbons

Morse Chain Co. has appointed Southern Bearings Service Co., Memphis; Kelly Supply Co., Grand Island, Neb.; and L. B. Adams & Co., Baton Rouge, La., as agents.

Hercules Powder Co., Naval Stores Dept., has selected the Denver Fire Clay Co. as distributor.

Nutting Truck & Caster Co., Fairbault, Minn., has appointed the Pope Equipment Co., Cincinnati, as sales agent.

T. Shriver & Co., Inc., Harrison, N. J., has named The Watts Co., Houston, as sales representative in Texas and Louisiana.

Wolverine Tube has selected the A. B. Murray Co., Elizabeth, N. J., as sales agent for its condenser and heat exchanger tubes.

Acheson Dispersed Pigments Co., Philadelphia, has appointed B. E. Dougherty Co., Los Angeles, as west coast distributor.

Cochrane Corp., Philadelphia, has appointed Turbine Equipment Co., Glen Falls, N. Y., as representative in upstate New York.

New Lines

American Locomotive Co. will now offer a full line of prefabricated pipe upon the acquisition of Central Pipe Fabricating & Supply Co., Cincinnati.

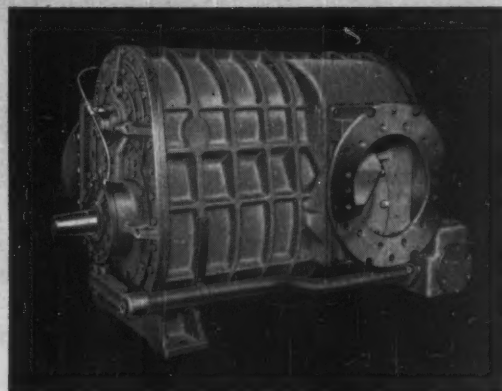
Hapman Conveyors, Inc. will now build additional types of bucket, belt, drag and special conveyors to handle bulk materials.

American Box Co. will initiate the production of corrugated containers supplementing its line of wirebound, cleated-panel products.

P. K. Industries, Inc., has acquired a non-exclusive contract with



THE *Standardaire®* Blower



*offers the
chemical
industry
all these
advantages*

... Smooth, even compression with no pulse-beats or pressure surges. The *Standardaire* achieves this by employing a proved principle of compression on a modified adiabatic cycle.

... Compactly designed, the *Standardaire* handles large capacities of gas or air at a low noise level. There is no need for heavy, reinforced floorings, foundations or piping anchors with a *Standardaire Blower*.

... *Standardaire's* new, mechanical positive face type shaft seals retain all gases within the rotor chamber ... eliminating the hazards of escaping gases.

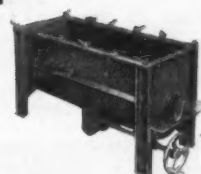
... *Standardaire Blowers* deliver more gas or air, with less wear, maintenance and power costs than other blowers of equal weight and size.

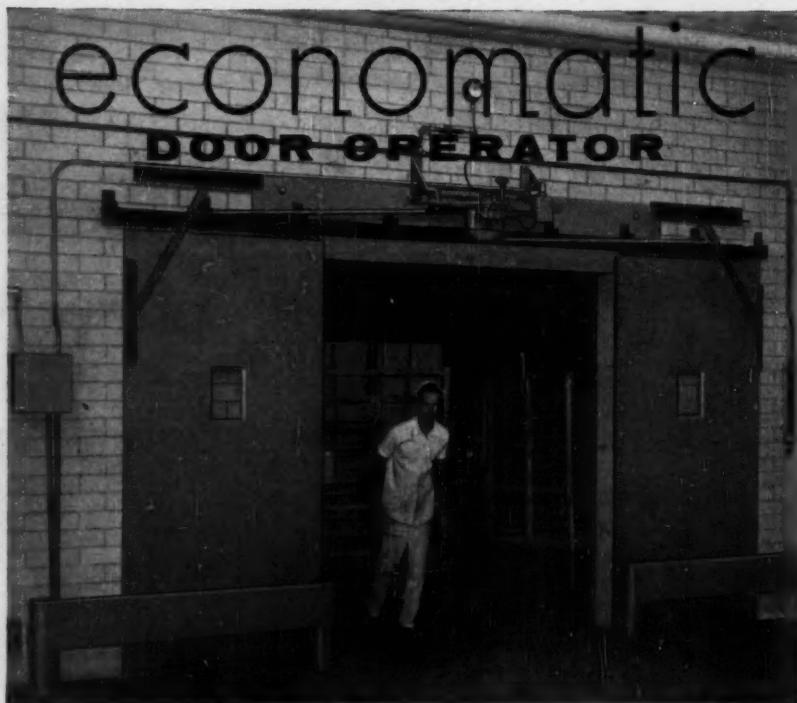
Get all the reasons why you should install a *Standardaire Blower* today, write for our Bulletin B-154.

READ STANDARD
CORPORATION

Read Standard also manufactures a complete line of blenders for laboratory and industrial use. For further information write, Read Standard Corp., York, Pa.

BLOWER-STOKER DIVISION
370 Lexington Avenue
New York 17, New York





Opens The Door To New Savings in faster materials handling – improved temperature and humidity control

In the average plant, materials handling consumes up to 26% of production time! **ECONOMATIC** Automatic Door Operators cut this time drastically by giving traffic an uninterrupted flow . . . making manhours more productive.

ECONOMATIC also improves temperature and humidity control; reduces air conditioning and heating costs; shuts out dust, drafts, odors and noise; assures positive fire door protection and reduces expensive door damage.

ECONOMATIC also provides extra safety in plants where hazardous areas exist. It can be equipped with completely pneumatic controls and safety interlocks to ensure the "sealing-off" of adjacent departments.

opens itself, closes itself, pays for itself

Get all the facts on how **ECONOMATIC** *pays for itself* in 2 to 3 months.

Just send this coupon today.

NATIONAL PNEUMATIC CO., INC. AND HOLTZER-CABOT DIVISIONS

125 Amory St., Boston 19, Mass.
Sales Service Representatives
in Principal Cities throughout the World



Designers and manufacturers of
mechanical, pneumatic, hydraulic, electric
and electronic equipment and systems

Automatic Door Division
National Pneumatic Co., Inc.
125 Amory St., Boston 19, Mass.

Please send me the facts on how **ECONOMATIC** saves money and manpower.

NAME _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

FIRMS . . .

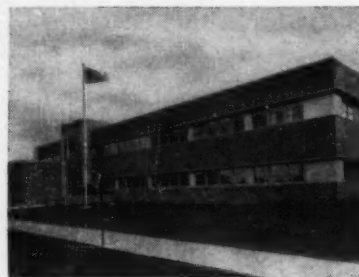
Paul Valve Corp. for the manufacture of the Paul venturiball valve.

Nat'l Tank & Pipe Div., M & M Woodworking Co., will now produce plastic pipe in addition to its regular line of wood products.

A. M. Byers Co. is now actively marketing corrosion-resistant cold drawn wrought iron tubing for heat transfer apparatus.

American-Marietta Co. will diversify its interests through the \$10 million acquisition of Standard Lime & Stone Co., Baltimore.

New Facilities



Union Carbide & Carbon Corp. has consolidated its Cleveland offices in a modern office building at 1300 Lakeside Avenue.

Transparent Package Co., Chicago, mfr. of cellulose of plastic film casings for foods, has opened a \$100,000 San Francisco plant.

The Fluor Corp. Ltd. has affiliated with Singmaster & Breyer, New York metallurgists and chemical engineers.

Pennsylvania Salt Mfg. Co. has acquired the assets of the I. P. Thomas & Son Co., Camden, N. J.

Food Machinery & Chemical Corp. has shifted the chemical activities of its central research dept. at San Jose, Calif. to its laboratories in New York.

Linz Nitrogen Works, Upper Austria province, will build a 10,000 metric ton annual capacity urea plant—costing \$1 million.

Excelsior Refineries Ltd. has begun preliminary construction of its \$1.5 million 2,000 b/d thermal cracking unit in British Columbia.

Robertshaw-Fulton Controls Co. has opened a new sales office for its Fielden Instrument Div. in Philadelphia.

E. I. du Pont de Nemours & Co., Inc., plans to construct additional facilities for polyisocyanates production in Deepwater Pt, N. J.

Babcock & Wilcox Co. has purchased the assets of the Globe Steel Tubes Co., Milwaukee.

The American Ceramic Society has occupied its new office building in Columbus, Ohio.

Northwestern Refining Co. has launched a \$420,000 project at its St. Paul Park, Minn., plant to boost output.

Westinghouse Electric Corp. plans to construct a multi-million dollar metals plant in Blairsville, Pa.

Shell Petroleum Co.'s agricultural research center near Kent, England, is undergoing a \$420,000 expansion.

The Upjohn Co. has opened a modern branch office building to serve the Rocky Mt. area.

Western Phosphates is adding a second concentrator on its phosphoric acid line at the Garfield, Utah, plant.

Illinois Institute of Technology, Armour Research Fdn., will construct a \$1 million laboratory building for engineering research.

Pacific Tube Co., Los Angeles, Calif., has broken ground for a major expansion of its stainless steel tube pickling facilities.

Goodall Rubber Co. and its subsidiary—have authorized the merger of the two firms with



Pangborn Dust Control Saves \$14,000 a year for Woodall

The Long Island plant of Woodall Industries, Inc., had a serious problem. Fabricating Masonite for its hundreds of products released so much dust that, without efficient dust control, work would be practically impossible. So Woodall installed a Pangborn Dust Control system.

The result? The dust collected not only leaves the plant dust-free but provides *all* the fuel for heating and processing requirements. Savings on fuel bills amount to \$14,000 a year! Pangborn Dust Control at Woodall pays its own way *with a profit* for the firm.

Pangborn can solve *your* dust problem. Pangborn engineers will be glad to show you how Pangborn Wet or Dry Dust Collectors can save you time, trouble and money!



See how Pangborn benefits varied industries. Write for free copy of "Out of the Realm of Dust." Pangborn Corp., 2600 Pangborn Blvd., Hagerstown, Maryland.

Pangborn

CONTROLS DUST

get acquainted with the newest addition to

the **WILLIAMS LINE** of

COPPERAS TYPE PURE RED IRON OXIDES

OUR NEW **100** SERIES

Available in 6 Shades ranging from
a Light Salmon Red to a Medium Maroon
R-2200, R-2900, R-3200, R-3800, R-4800, R-5800

Broad range of applications includes paints, rubber, building materials, leather finishes, plastics, paper, etc. Let our samples prove the value of these pigments. See your Williams representative or write us direct.

Compared with our other standard Copperas Reds, the "100" Series is

Brighter in color
Finer in particle size
Lower in oil absorption
Higher in purity
--at no increase in price!

WILLIAMS
COLORS & PIGMENTS

C. K. Williams & Co.

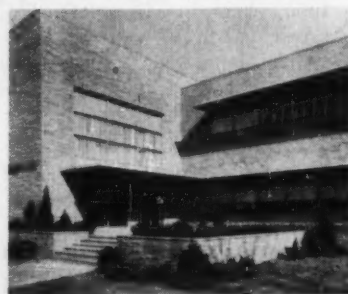
E. ST. LOUIS, ILL. • EASTON, PA. • EMERYVILLE, CAL.

FIRMS . . .

Goodall serving as parent organization.

Procter & Gamble has planned a \$300,000 addition to its factory, in Chicago, for its edible products.

Tide Water Associated Oil Co. has organized an oil purchase and exchange department.



J. F. Pritchard & Co., engineering firm, has opened a modern general office structure in Kansas City, Mo.

Philadelphia College of Pharmacy and Science has placed in operation a new laboratory for pharmaceutical research.

Liston-Becker Instrument Co. has begun construction of a new wing at its Springdale, Conn., plant for the production of infrared analyzers.

Multi-Clean Products, Inc., St. Paul, Minn., has expanded its manufacturing and cooling facilities for floor finishes and cleaners.

General Electric Co. plans to make its pure tungsten and molybdenum products generally available on the open market.

Robertshaw-Fulton Controls Co., Fielden Instrument Div., has expanded its plant and office facilities in Philadelphia.

Eldon Mfg. Co., Los Angeles, has acquired Econ Fiber Glass—producer of reinforced plastics.

Pfaunder Co. has just opened a new regional sales office in Kansas City, Kans.

Champion-International Paper Co., Lawrence, Mass., has dedicated a \$250,000 debarking mill at Bow, N. H.

The Carborundum Co. has just completed new warehouses and office buildings near Los Angeles and San Francisco.

Worthington Corp.'s Spanish associate, Bombas y Construcciones Moncanicas Worthington, S. A., has opened a new plant in Madrid.

Texas International Sulphur Co. has made its first shipment of processed sulfur from its autoclave plant in Baja California, Mex.

Imperial Chemical Industries Ltd. has decided to expand its Billingham plant in County Durham, Eng., for the manufacture of alcohols.

The Glidden Co. will begin construction of a 6½ million bushel terminal grain elevator in Chicago.

Bakelite Co., Bound Brook, N. J., has announced new facilities for the production of polystyrene and high-impact styrene molding.

Minneapolis-Honeywell Regulator Co. has purchased all outstanding capital stock of Doelcam Corp., Boston instrument firm.

Shieldalloy Corp. has completed processing facilities at Newfield, N. J., for full-scale production of special alloys.

Imperial Oil Ltd. has authorized Foster Wheeler Corp. to design and construct extensive process facilities at its Halifax refinery.

Phillips Petroleum Co. has established the Phillips Agricultural Demonstration Project north of Foraker, Osage County, Okla.

Standard Oil Co. of Calif. will build the first complete modern

PUMP STUFFING BOXES

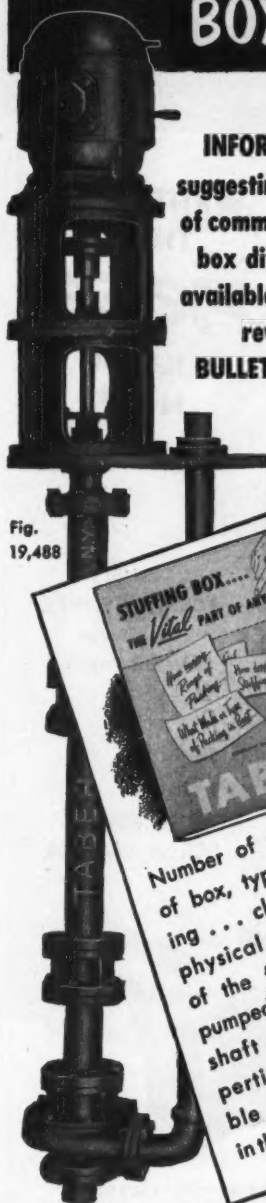


Fig.
19,488

INFORMATION
suggesting solution
of common stuffing
box difficulties;
available in newly
revised
BULLETIN S-147



Number of rings, depth
of box, type of pack-
ing . . . chemical and
physical properties
of the fluid being
pumped, speed of
shaft and other
pertinent usa-
ble facts are
in this Bulletin.

WRITE on business stationery for your
copy of Bulletin S-147.

TABER PUMP CO. (Est. 1859)
294 ELM ST. • BUFFALO 3, N. Y.

Fig. 6041



TABER

Improve
your operation

**TENNESSEE'S
SO₂**

**Liquid
Sulphur
Dioxide**

If you have use for a superior reducing or bleaching agent, antichlor, preservative, neutralizer, or pH control, then Tennessee's highest grade Liquid Sulphur Dioxide can no doubt greatly improve your present operation and do it more efficiently and economically.

Versatile Liquid Sulphur Dioxide can, perhaps, improve upon your present production process. We would welcome the opportunity to discuss with you the possibilities of Tennessee's highest grade Liquid Sulphur Dioxide as adaptable to your operation.

TENNESSEE **TC** CORPORATION
Sulphur Dioxide Division

211-29 Grant Building, Atlanta, Georgia

How to Dewater, Classify and Remove Waste from Sand, Limestone and Similar Materials *

**SCREW
WASHERS**

WRITE FOR
THIS
FREE
BULLETIN
NOW

**DOUBLE
SCREW WASHER
with Gear
Cover Removed**

**SINGLE
SCREW WASHER**

* Here's a new bulletin you should have—on cleaning, dewatering, classifying sand and other coarse or fine materials—with McLanahan Single or Double Screw Washers. Complete details on models, capacities, screw sizes, etc., available. Write for your copy today!

**McLANAHAN & STONE
CORPORATION**

PIT, MINE AND QUARRY EQUIPMENT HEADQUARTERS SINCE 1835

FIRMS . . .

oil refinery in the Hawaiian Islands costing \$25-\$30 million.



Librascope has opened its new engineering facilities for the manufacture of analog and digital computers.

Rohm & Haas Co., chemical and plastics firm, has purchased several tracts of land just off the Ship Channel, San Jacinto, Texas.

John Hopkins University has dedicated its new \$1½ million engineering building known as Ames Hall.

American Blower Corp., Dearborn, Mich., has opened a direct factory branch office in Phoenix, Arizona.

Celanese Corp. of America has broken ground for an expansion of the plastics capacity of its Belvidere, N. J., plant.

Fluor Corp. has opened a new district sales office in Denver, Colo.

Pittsburgh Plate Glass Co. has opened a new ultra-modern structure to house laboratories for its paint and brush division.

Carton de Colombia, S. A., affiliate of Container Corp. of America, will expand with the addition of a plant at Barranquilla, Col.

Shell Chemical Corp. has launched the largest barge for the transportation of anhydrous ammonia. It was built by Bethlehem Steel.

H. K. Porter Co., Inc., has acquired the Riverside Metal Co., mfr. of non-ferrous metals.

Continental Oil Co. has offered to buy Kirby Petroleum Co.

Swift & Co.'s nutrition research has been expanded with the opening of new laboratory facilities in Chicago.

Servomechanisms, Inc., is constructing a new building at Los Angeles International Airport, to replace 5 smaller structures at El Segundo.

Eastern Gas Board of Eng. has placed an order with Power Gas Corp. for the construction of a catalytic oil gas plant near London.

Monterey Oil Co., Los Angeles, has purchased all the oil and gas properties and assets of Fullerton Oil & Gas Corp., Pasadena.

Air Placement Equipment Co., Kansas City, Mo., mfr. of Bondactor equipment, plans extensive expansions in its distribution program.

The Ideal Cement Co. will devote \$5.5 million to improve storage and distribution facilities at its Alabama and Texas plants.

Food Machinery & Chemical Corp. will absorb its subsidiary—Buffalo Electro-Chemical Co., Inc.—and operate it as its Becco Chemical Division.

Angier Products, Inc., Cambridge, Mass., mfr. of industrial adhesives, has opened its western div. in Huntington, Ind.

Pennsylvania Salt Mfg. Co. has acquired all the assets of Gilon Products Co., Cleveland, Ohio, metal processing chemicals firm.

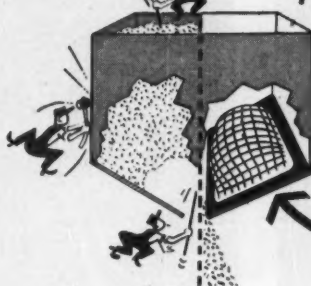
Atomic Energy Commission has completed its seventh uranium plant expansion on the Colorado Plateau.

Union Oil Co. of Calif. has bought the asphalt and products refinery of Sunray Oil Corp., at Santa Maria, Calif.

PULSATING PANELS

eliminate flow stoppage in bins!

If you have material hang-up problems in bins,



PneuBin

will save you money!



PneuBin will solve your flow stoppage problems and reduce your operating expense. The PneuBin unit consists of steel-backed, neoprene, pulsating panels mounted on the inside wall of your present bins and air controls to regulate the panels' action. By the pneumatic inflation and deflation of the PneuBin panels, the bin contents are positively displaced to insure free flow. After the panels have deflated, the air control unit (operating off the regular plant air supply) starts another cycle of inflation and deflation. The process continues *automatically* at whatever frequency is set on the air controller (this frequency is adjustable).

How PneuBin Saves Money

PneuBin decreases plant operating costs by reducing maintenance, insures constant material flow to production lines and greatly increases personnel efficiency through its quiet operation.

Send for "Flow Stoppage Report" and FREE Literature

PneuBin engineers will gladly make recommendations with no obligation on your part.

PneuBin

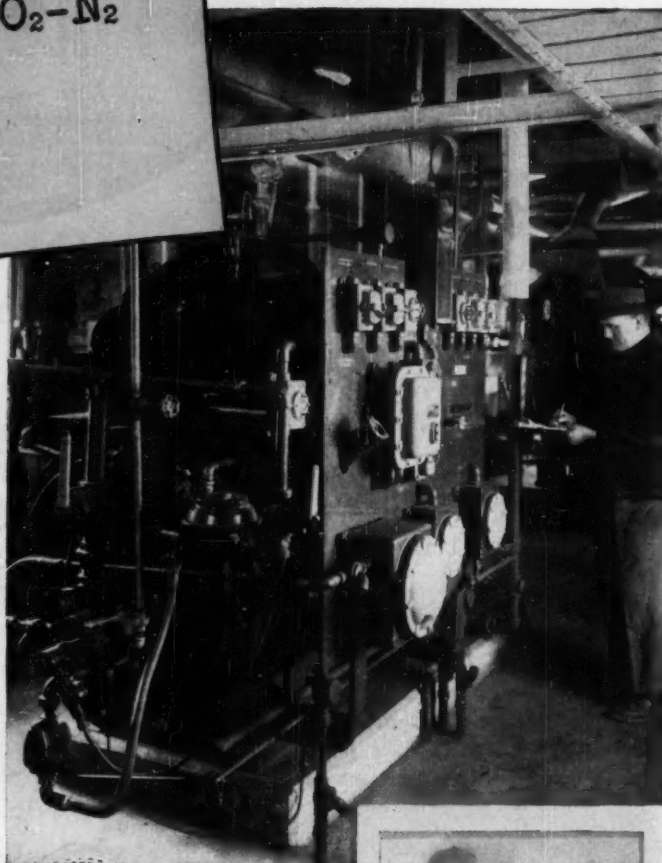
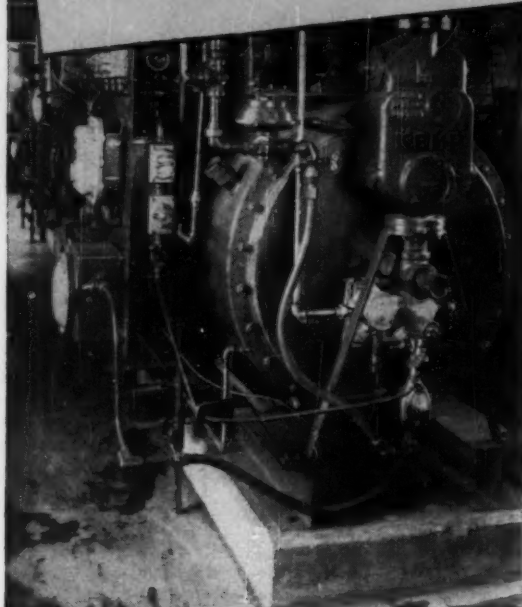
A PRODUCT OF

GEROTOR MAY CORPORATION

1525 Maryland Ave., Baltimore 3, Maryland

Case No. 62

Kemp-Generated $\text{CO}_2\text{-N}_2$ Cuts Fire Hazard at Polymer Corp.



How Polymer operated day and night for 10 years at maximum safety

When Polymer Corporation, Ltd., Sarnia, Ontario, began operations in 1943, inventory included two Kemp MIHE Inert Gas Generators. Since that date, Polymer—and its Kemp equipment—has been operating 24 hours a day, 365 days a year. The huge quantities of man-made rubber and associated chemicals it produces—200,000,000 pounds during one year alone—reach, in one form or another, the four corners of the world.

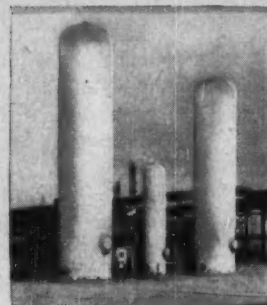
Kemp Plays an important Role

The high volatility of many of the ingredients used in this giant operation necessitates blanketing and purging vessels after use. It is in this step that Polymer employs Kemp Generators to assure safe, trouble-free performance. The gas they produce is piped to different operations over the entire company area—it *must* be clean! Kemp does the job—

Polymer knows that it can depend on Kemp to deliver a *clean inert at a specific analysis, regardless of demand.* And every Kemp Generator is engineered for fast starts and easy operations that save *time and money.*

Kemp Can Do a Job for You

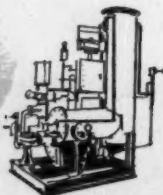
Kemp superiority is no accident. It is based on years of experience . . . on quality of design to meet specific problems. Every Kemp design features the Kemp Industrial Carburetor for complete combustion without tinkering or waste . . . for simplified installation and maintenance. Every Kemp design includes the latest fire checks and safety devices. If you have a blanketing or purging problem, contact Kemp engineers. They will be glad to study your situation and recommend the installation best suited to your needs. No obligation, of course.



Gas generator building from which inert gas is piped over 130 acres of company property at Polymer's Sarnia, Ontario, operation.

For more complete facts and technical information, write for Bulletin I-10 to: THE C. M. KEMP MFG. CO., 405 East Oliver Street, Baltimore 2, Md.

KEMP OF BALTIMORE



INERT GAS GENERATORS

CARBURETORS • BURNERS • FIRE CHECKS
METAL MELTING UNITS • ADSORPTIVE DRYERS
SINGING EQUIPMENT

COOPER ALLOY

CORPORATION BRIEFS

• Edited by GEORGE BLACK

DESIGN ENGINEERS CONFER

Two recent conferences at Cooper Alloy brought together almost two hundred of the nation's leading design engineers concerned with cast stainless steel products. The purpose of these conferences was fourfold: 1) to present data on new alloys 2) to review basic concepts of design in relations to the stainless steels 3) to present up-to-the-minute information on the shell molding of high alloys 4) to show how the cast weld method is being used to cut costs. The four technical papers were printed in the October 1954 issue of Newscast. Copies are still available on request.



NEW VALVE CATALOG READY

More than two years in the making, the new COOPER ALLOY stainless steel valve catalog will soon be available. The design provides for an easy to use 64 page booklet, a more elaborate plastic bound shelf catalog, a deluxe looseleaf variation and a desk type card catalog. We can also supply you with individual catalog cards which can be marked and sent along with your order or quotation requests. Our representative will be happy to show you the various types available so that you can choose the one which best suits your needs. A phone call or letter will start him on his way.



ADVANCED KNOW-HOW SERIES

An interesting series of case histories showing how advance foundry technics have brought new dimensions to the scope of high alloy castings is being prepared by our Foundry Products Division. Each study will cover a specific part which because of its complexity or because of unusually high quality requirements, or both, presented a problem that couldn't be solved with conventional foundry practice. The methods used to achieve sound castings for these "castings which couldn't be cast" will be explained in detail. If you would like to receive this series as it is prepared, please drop us a note on your letterhead.

COOPER ALLOY
CORPORATION • HILLSIDE, N.J.

3 good reasons for buying COOPER ALLOY stainless steel FITTINGS



- **AVAILABILITY.** Our network of stocking distributors with warehouses and branches in every major industrial city, is backed up by our own extensive stocks in Hillside, New Jersey and Oakland, California to insure delivery when you need it.
- **QUALITY.** As the world's largest and most experienced producer of stainless steel fittings, with the most complete production and inspection facilities, COOPER ALLOY sets the quality standard for the entire industry.
- **COMPLETE LINE.** Whatever your needs . . . whether for screwed, flanged, welding or Quikupl fittings, you will find what you're looking for in the COOPER ALLOY line.



SCREWED. All pipe threads on COOPER ALLOY stainless steel fittings are checked to American Standard Tapered pipe thread gauges, and the use of special tools and equipment assures full threads, accurately gauged and perfectly aligned in all planes.



FLANGED. General dimensions of COOPER ALLOY stainless steel flanged fittings conform to standards set by the American Standards Association for steel flanged fittings . . . or to Manufacturer's Standardization Society specifications for corrosion resistant flanged fittings.



WELDING. COOPER ALLOY stainless steel welding fittings are manufactured in accordance with ASA standards where applicable. They are made of forged or rolled stainless steel; all fittings are of uniform wall thickness and the ends, where wall thickness are greater than .083", are accurately machine tool cut and beveled.



QUIKUPL. These patented stainless steel fittings are designed for quick assembly without threading, welding or flaring. They cut installation or disassembly costs to a minimum, and are ideal for permanent or temporary use.

Write today for copy of Fitting Catalog 52F

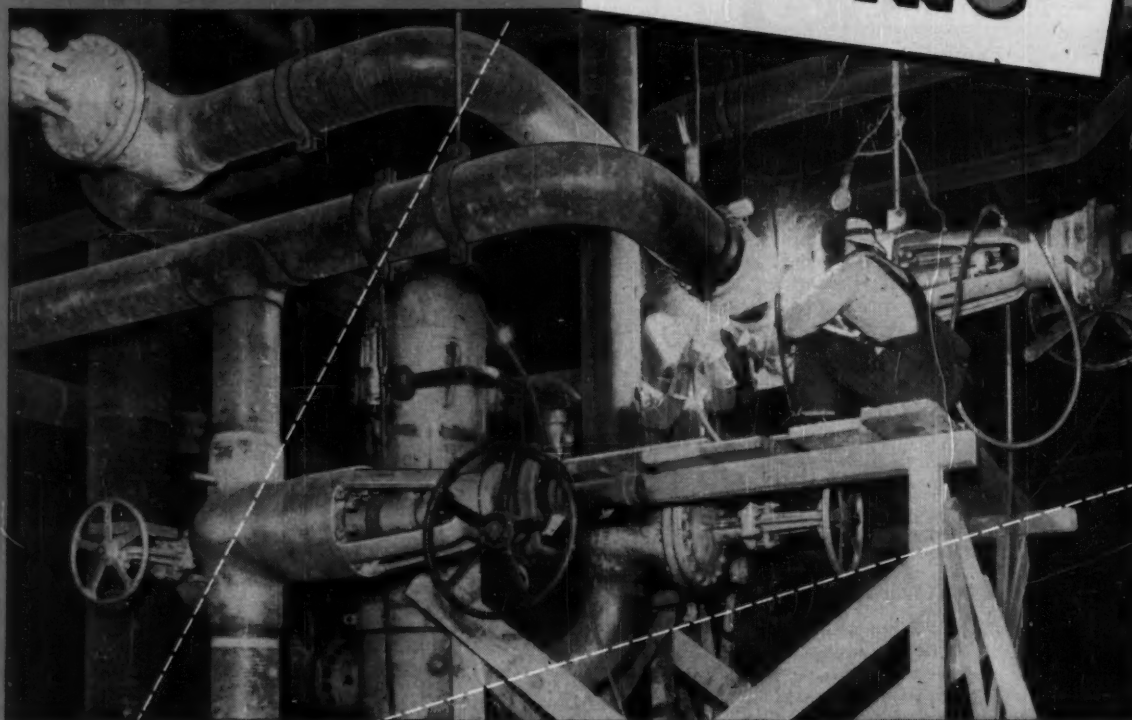
COOPER ALLOY
CORPORATION • HILLSIDE, N.J.
Valve and Fitting Division



THERE IS

MUCH MORE TO

**MIDWEST
PIPING**



THAN MEETS THE EYE

Here you see carefully qualified Midwest welders erecting the boiler feed piping in a new public utility steam-electric generating station. What you don't see are the many other highly skilled men who contribute to the high quality of Midwest Piping.

First, there are the expert piping engineers who prepare the job for fabrication. They simplify the field work and make sure the difficult operations are done in the shop. And they often make suggestions that improve the design and reduce the cost of the piping.

Then there is the experienced shop organization (working with the most modern equipment) that delivers to the field subassemblies which are

accurate in dimension, correct in alignment, thoroughly cleaned, heat treated when necessary, carefully inspected and tested . . . ready for erection at lowest cost. Both the shop and field supervisory personnel have come up through the ranks and know every phase of the operations . . . how to assure the customer the most for his money when he buys Midwest Piping.

MIDWEST PIPING COMPANY, INC.

Main Office, 1430 South Second St., St. Louis 4, Mo.

PLANTS: ST. LOUIS, PASSAIC, LOS ANGELES, and BOSTON

SALES OFFICES: NEW YORK 7—50 CHURCH ST. • BOSTON 27—426 FIRST ST.

LOS ANGELES 33—520 ANDERSON ST. • CHICAGO 3—79 WEST MONROE ST.

TULSA 3—224 WRIGHT BLDG. • HOUSTON 2—1213 CAPITOL AVE.

CLEVELAND 14—616 ST. CLAIR AVE.

MIDWEST

**PIPING FABRICATION
and CONSTRUCTION**

OFFERS YOU MANY BENEFITS

OVER 300 MUNICIPALITIES USE ACCELATOR® Treating Plants



*...for less space...for less cost
...for better results*

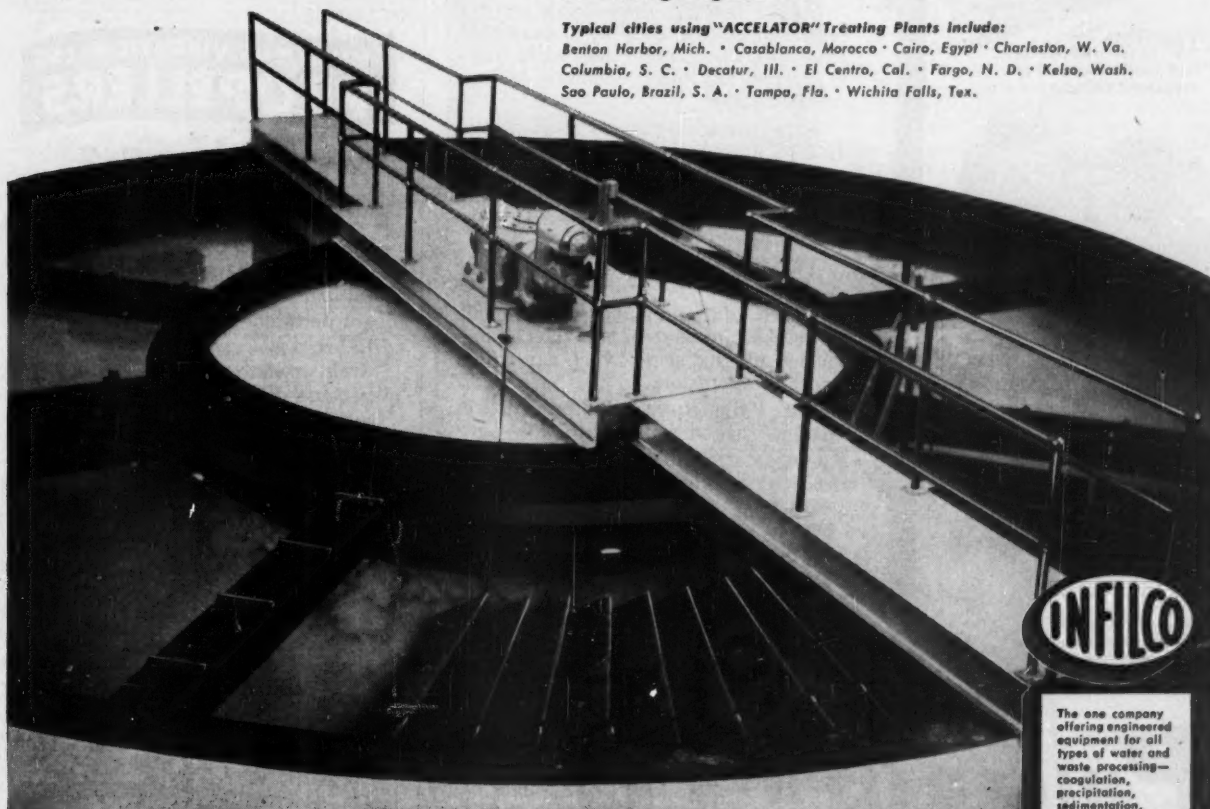
Combining mixing, coagulation and solids separation in a single unit, "ACCELATOR" plants have a proven record for flexibility, uniformly good effluent, ease of operation and chemical economy. By using the principle of slurry recirculation and dynamic separation, "ACCELATOR" plants soften, stabilize and clarify water at consistently higher rates. This means more capacity from smaller units and substantial savings in construction and operating costs. In addition "ACCELATOR" treating plants produce better water. Tests have shown over 99% removal of bacteria and algae, as well as more complete removal of turbidity, color, iron and hardness.

Present installations are delivering from 15,000 to 75,000,000 gallons per day. Units can be engineered for any capacity to meet your requirements. These and many other advantages are reasons why it will pay to install an "ACCELATOR" plant to serve your community.

Write for complete catalog information or see your Consulting Engineer.

Typical cities using "ACCELATOR" Treating Plants include:

Benton Harbor, Mich. • Casablanca, Morocco • Cairo, Egypt • Charleston, W. Va.
Columbia, S. C. • Decatur, Ill. • El Centro, Cal. • Fargo, N. D. • Kelo, Wash.
Sao Paulo, Brazil, S. A. • Tampa, Fla. • Wichita Falls, Tex.

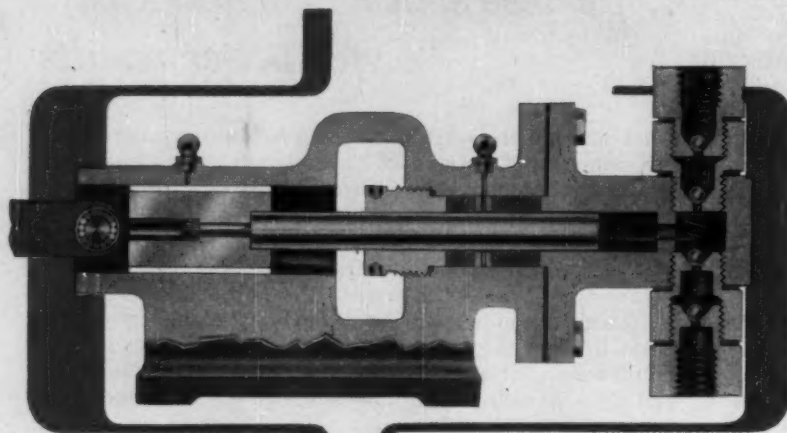


The one company
offering engineered
equipment for all
types of water and
waste processing—
coagulation,
precipitation,
sedimentation,
flotation, filtration,
ion exchange and
biological treatment.

5534

INFILCO INC. 905 South Campbell Ave. Tucson, Arizona
Field offices in principal cities in North America

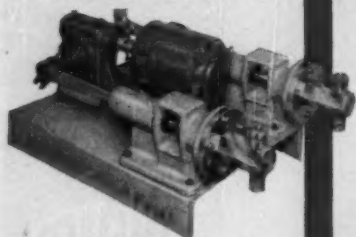
Engineers who know pumps best ... select Philadelphia Pumps



Simplex Pump, Model S-501 for controlled capacities from 5 cc per minute to 5 gph. Pressures to 1500 psi.



Philadelphia Pump showing rocker arm micro-adjustment for varying pump capacity in operation.



Heavy Duty Duplex Pump, Model S-3032 for controlled capacities to 750 gph. and pressures to 10,000 psi.

Philadelphia controlled capacity chemical pumps are designed for pump men—to meet the practical requirements of low initial cost, operating and maintenance economy.

Design features dependable, common sense, low cost arrangements that offer better service with less grief than any other chemical pump on the market.

For instance all Philadelphia Pumps are constructed to allow removal of all moving parts through the oversized crosshead without breaking piping connections—a great advantage in maintenance.

Packing gland is easily accessible at both ends.

Valves of liquid ends are machined of solid stainless steel bar, thus eliminating pressed seats which can work loose in operation.

All Philadelphia Pumps feature strong, rugged construction.

Automatic capacity control mechanisms include conventional rocker arm with Micro-adjustment, Uni-Feeder and patented "Philatrol."

For complete description of Philadelphia Pumps and Pump Selection Chart, write for new Bulletin S-1254. PHILADELPHIA PUMP & Machinery Co., Inc., 1513 Race St., Phila. 2, Pa.

PHILADELPHIA PUMP

AND MACHINERY COMPANY, INC.

SUBSIDIARY OF AMERICAN METER COMPANY / EST. 1836

Like to try it?

Ever wished you could try out a Brookfield Viscometer right in your own Lab or plant? With your materials and your problems? At absolutely no risk? Now you can do just that! Send for simple details of Brookfield's Free Trial plan. Write today.



WITH A
Brookfield

SYNCHRO-ELECTRIC
VISCOMETER

... you make determinations directly in centipoises. Just flip on switch and read the dial. It's as easy as taking temperature readings. Availability of single and multi-speed models, and special accessories, enables accurate work with both Newtonian and non-Newtonian materials. Effective range: 1 to 32,000,000 CPS.

See for yourself, at no risk of any kind, how a Brookfield Viscometer can save you time, trouble, dollars. Write Dept. C

Brookfield Engineering Laboratories, Inc.
260 Cushing Street, Stoughton, Mass.

SMOOTH — VIBRATIONLESS PROPELLERS

for MIXING, STIRRING, AERATING, PUMPING, etc.

Manufactured by an exclusive process, MICHIGAN propellers are perfectly balanced to avoid whip and strain on shafts. And because of their superior functioning are now standard parts of the products of many leading equipment manufacturers.



MODEL GDA - MIXER
BY INTERNATIONAL ENGINEERING DAYTON, OHIO

Available for special application and replacement, as well as original equipment, in a wide variety of metals and in sizes up to 60". Write for latest data folder.

MICHIGAN WHEEL CO.
GRAND RAPIDS 3, MICH.

U.S.I. CHEMICAL NEWS

Jan.-Feb.

★

A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries

★

1955

NEW NATIONAL DISTILLERS' AMMONIA PLANT NOW ON STREAM

National Distillers Announces 3 Appointments In Chemical Division

Three appointments highlighting the integration of all National Distillers Products Corporation chemical activities into one division were announced this month by Dr. Robert E. Hulse, Director of the Chemical Division, and a Vice President of both National Distillers Products Corporation and of its subsidiary, National Petro-Chemicals Corporation.

Lee A. Keane, Vice President of U. S. Industrial Chemicals Co., Division of National Distillers Products Corporation, has been named Director of Chemical Sales, and will be in charge of the sales of all the corporation's chemical products.

Robert H. Cornwell has been appointed Director of Production, and will be responsible for production activities of all chemical plants of the corporation and its subsidiaries.

Dr. Stuart Schott has been named Director of Research, and will be in charge of the research division which will conduct research and pilot plant operations for the entire corporation and its subsidiaries.

New "Argon Grade" of Metallic Sodium Seen Key to New Metals

"Argon Grade" Metallic Sodium is a recently developed form of sodium which is produced, specially filtered and packed in an atmosphere of argon gas. Sodium protected in this manner is recommended for use where traces of dissolved gases such as oxygen and nitrogen are undesirable.

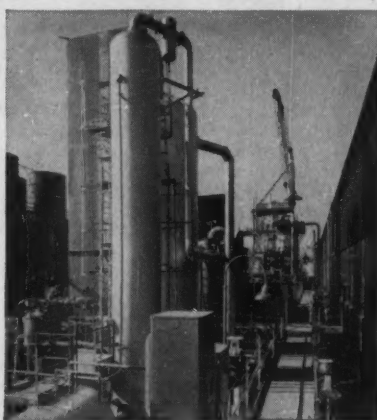
Development and commercial availability of this new product have been announced by the Chemical Division of National Distillers Products Corporation. This is the most recent step in National's program for developing forms and grades of metallic sodium which are easy to use and acceptable for a wide scope of industrial applications. Typical of this pioneering are earlier announcements on Sodium Dispersions and High Surface Sodium for many other uses.

For years the metal industry has benefited from the use of metallic sodium as a reaction tool. Used in an early commercial process for aluminum and more recently for rapid, efficient descaling operations in the production of stainless steel and other metals, sodium today points the way to new or improved methods for producing titanium, zirconium, silicon, tantalum, hafnium, etc. With the help of this versatile element, ductile metal and finely divided metal powder catalysts can be made from metal salts and oxides. For more information on adapting sodium to your needs, write Editor, U.S.I. Chemical News.

Capacity of 60,000 Tons Per Year to Help Meet Growing Needs of Midwest Agriculture, Industry

January 21 marked the opening of National Distillers' new \$7 million synthetic ammonia plant at Tuscola, Illinois—the most recent step in National's long-range program of growth and development in the chemical field. This new plant which will produce ammonia from "off-gas" from a hydrocarbon

cracking operation, is the largest of its kind in the United States. It will have a capacity of 60,000 tons of ammonia per year by mid 1955 and will produce anhydrous ammonia and a variety of nitrogen solutions for the expanding agricultural and industrial markets of the Midwest.



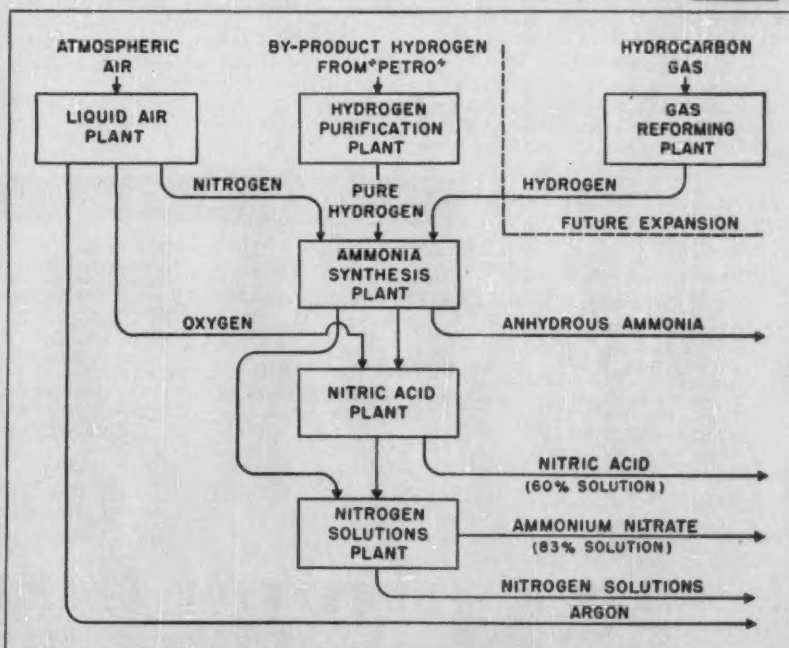
Shown here are the nitrogen wash column and the cold box of the air separation unit.

Uses By-Product Hydrogen

While hydrogen for most ammonia plants is obtained through "reforming" of natural gas, National Distillers has a ready-made source of supply—a hydrogen-rich "off-gas" from cracking operations at National Petro-Chemicals Corporation's ("Petro") huge ethylene plant located on adjacent property.

Nitrogen is obtained by air liquifaction and fractionation, with by-product oxygen being used in other processing operations. Studies by National's technical staff indicate that the use of by-product hydrogen is more economical than decomposition of natural gas from a standpoint of capital investment and production costs.

MORE



Simplified flow diagram of the National Distillers' synthetic ammonia plant in Tuscola, Ill.

Jan.-Feb.

★

U.S.I. CHEMICAL NEWS

★

1955

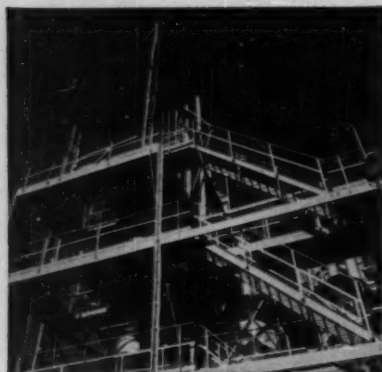
CONTINUED

New Ammonia Plant

Nitrogen Solutions

The nitrogen solutions are obtained by converting a part of the ammonia to nitric acid. The nitric acid is reacted with more ammonia to yield ammonium nitrate solutions. A variety of nitrogen solutions will be "custom-made" to satisfy the customer's requirements with respect to nitrogen content.

Nitrogen solutions are used in the manufacture of finished fertilizer and also for direct



Ammonia converter installation at National's new 60,000 ton a year ammonia plant.

application to the soil. National has storage facilities for anhydrous ammonia and nitrogen solutions to take care of some seasonal fluctuations in the demand for these products.

More Nitrogen Fertilizer Used

Consumption of fertilizer nitrogen is increasing enormously in all Midwestern states, and by 1955 demand in this area is expected to exceed 300,000 tons, according to the U.S. Department of Agriculture. Tuscola, Ill., is located in the heart of this rich farming region and makes an ideal site for National's new plant — the first of its kind in that state.

Higher Yields

According to authoritative agricultural reports, an average of 10 pounds of nitrogen per acre was used in the corn growing areas during 1950. With this level of fertilizer nitrogen,

New Light on Methionine Boost to Fish Meal Rations

During recent studies on sulfur bearing amino acids, indole was found to have a growth-retarding effect on the animals tested. However, the researchers also found, that methionine conjugated or combined with indole in such a way as to render this growth-retarding action ineffective. Since high levels of indole are present in fish meal and its products of digestion, this deactivation of indole is thought to explain the beneficial effects obtained when methionine is added to rations containing high levels of fish meal. Indole and other types of toxic putrefactive compounds are built up in fish products when decomposition sets in before processing.

the average yield was 42 bushels per acre. According to these reports, application of 40 pounds of nitrogen instead of 10 increased the yield by 13 bushels per acre. At average farm prices this extra 30 pounds of nitrogen produced a profit over increased fertilizer costs of \$15.75 per acre or 420% return.

Increased use of fertilizer nitrogen gives proof that farmers and farm leaders are becoming increasingly aware of the profitability of higher nitrogen levels in fertilizer programs. National Distillers' facilities for producing raw materials for the fertilizer industry assures the Midwest of a dependable source of supply to meet these demands.

Emphasis on Raw Materials

In addition to the new ammonia plant, National has four Midwestern sulfuric acid plants with a combined capacity of over 1,000 tons of acid a day, much of which goes to the fertilizer industry. This is in keeping with National's intent to place greater emphasis on bulk industrial chemicals and to expand operations where the company has competitive advantages by virtue of low cost, integrated facilities, well situated as to markets. In addition, National has strongly emphasized that its policy is to produce raw materials for the fertilizer industry — not to manufacture finished fertilizer.

For further information on National Distillers' fertilizer chemicals write to Editor, U.S.I. Chemical News.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

A wide-spectrum "Idea" chemical (ethyl carbamate) with applications ranging from cancer therapy to the manufacture of plastics, reacts with organic and inorganic compounds to form intermediates or end products of commercial importance. (No. 1070)

Making corrugated cases easy to open, is the advantage of a new adhesive which seals cases securely during shipment and handling but still permits opening without struggle or use of knife. (No. 1071)

Moisture content of chemicals, clay, putty, and certain foods can be determined in less than 30 seconds according to the manufacturer of a new moisture tester. (No. 1072)

A floor tile with built-in adhesive on the back has been especially designed for do-it-yourself enthusiasts. Just strip off a plastic film and put the tile in place. (No. 1073)

Filtering compound for ultraviolet light, is reported to be particularly useful for sun-screen cosmetics. Safe for use on the skin, it is chemically stable, stable to ultraviolet light, and has excellent solubility. (No. 1074)

New lifting device for nonporous materials such as sheet metal, plate glass, etc., uses a vacuum cap that attaches to the moving object. Compressed air operating the hoist also creates the vacuum. (No. 1075)

A grease thickener said to make greases stand up better under high and low temperature operating conditions has been announced. Greases made with the new thickener have been boiled in water for days without breaking down. (No. 1076)

Oil for flushing mechanical vacuum pumps with risk of contamination from detergents or volatile additives is said to be ideal for removing old oil, sediment, and dirt which accumulates in the pump mechanism. (No. 1077)

Paint stripping and decarbonizing solvent works by cold immersion, is self-emulsifying, and according to the manufacturer, it strips paint and primers and cleans carbonaceous tars, coke and carbon varnish. (No. 1078)

New liquid metals pump has been developed which has no moving parts, uses electric current to do the pumping. As the current moves through the metal, it pushes the metal forward. (No. 1079)

PRODUCTS OF U.S.I.

ALCOHOLS

Butanol (Normal-Butyl Alcohol)
Fusel Oil — Refined

Ethanol (Ethyl Alcohol)

Specialty Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U. S. P.,
Absolute—200 Proof
Sajox®—proprietary solvent—regular and anhydrous

ETHERS

Ethyl Ether, U. S. P.
Ethyl Ether, Absolute—A.C.S.

ACETONE—A.C.S.

ANSOLS

Ansol® M
Ansol® PR

ACETIC ESTERS

Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate

OXALIC ESTERS

Diethyl Oxalate

OTHER ESTERS

Diatol®
Diethyl Carbonate

INTERMEDIATES

Acetoacetanilide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-tolaldehyde
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate

FEED PRODUCTS

Calcium Pantothenate (Feed Grade)
Choline Chloride Products
Curbay B-G® 80
DL-Methionine (Feed Grade)
Niacin, U.S.P.
Riboflavin Concentrates
Special Liquid Curbay®
U.S.I. Vitamin B₁₂ and
Antibiotic Feed Supplements
Vacatone® 40
Vitamin A, D₂, and K₂ Products

OTHER PRODUCTS

Anhydrous Ammonia
Caustic Soda
Ethylene
Liquid Chlorine
Metallic Sodium
DL-Methionine (Pharm.)
N-Acetyl DL-Methionine
Nitrogen Solutions
Propionic Acid
Sulfuric Acid
Urethan, U.S.P.

*Reg. U.S. Pat. Off.

U.S.I. INDUSTRIAL CHEMICALS CO.

Division of National Distillers Products Corporation

99 PARK AVENUE, NEW YORK 16, N. Y.

BRANCHES IN ALL PRINCIPAL CITIES

FINANCIAL AID TO HIGHER EDUCATION

Business Aid for Our Colleges— Voluntary or Involuntary?

Previous editorials in this series have shown that:

- As a group the nation's independent, privately endowed colleges and universities are in grave financial trouble, and
- There are many different means by which business firms can extend a helping hand to these institutions.

This editorial, one of a series devoted to the financial problems of higher education, submits this proposition: **If business firms do not voluntarily go to the financial aid of higher education, there is every prospect that they will soon be providing more financial support for higher education involuntarily, through taxation.**

If this prospect materializes, one of the basic elements of a well-balanced system of higher education—a strong array of independent colleges and universities—may well be dangerously weakened if not destroyed. And in the process a potentially crucial bulwark for freedom of enterprise in the United States—that same strong array of independent colleges and universities—will be undermined.

Acceptance of these propositions implies absolutely no disparagement of tax-supported colleges and universities. These have an indispensable role in the total system of higher education in the United States. Leaders of these

institutions would be among the first to agree that their position is strengthened by a strong system of independent institutions, supported privately rather than by political agencies.

What is the evidence that in one way or another, voluntarily or involuntarily, business will be giving more financial support to higher education? One impressive part of this evidence is provided by the recent rapid increase in the proportion of college and university students attending tax-supported institutions.

Rapid Shift in Enrollment

In the fall of 1952 tax-supported colleges and universities enrolled about 7.5 per cent more students than the independent institutions. In 1953 this percentage was doubled. And in 1954 the tax-supported institutions enrolled 26 per cent more students.

In the case of students entering college for the first time the relative growth of the tax-supported institutions recently has been even more striking. In 1952, the number of beginning students in the tax-supported schools, as reported by the U. S. Office of Education, exceeded those in the independent colleges and universities by 35 per cent. In 1954, just two years later, this figure jumped to 49 per cent.

Why has the proportion of students attending tax-supported colleges and universities been in-

creasing so rapidly? There are many reasons. But a dominant reason is that, in order to keep going at all, the independent institutions have been forced to make large increases in the prices they charge for instruction. The purchasing power of their endowment funds has been cut in half by price inflation. The capacity of the wealthy to supplement their endowments by gifts, as they have done in the past, has been greatly reduced by high taxes. As a result these schools have been forced to rely increasingly on higher prices for instruction (tuition as it is called in academic circles) to make both ends meet.

Since 1940, the independent colleges and universities have raised their tuition fees by an average of about 60 per cent. This is considerably less than the increase of about 100 per cent in prices generally since 1940. And it is nowhere near enough to prevent the faculty members of the independent colleges from faring miserably in terms of salaries, a matter of major national importance to which we shall return in this series. But the increase in tuition fees of the independent colleges has been much greater than the increase in the fees charged by the tax-supported schools. And that price differential increasingly tends to shunt students into the schools which are supported chiefly by taxes. Independent colleges now charge, on the average, about \$580 per year for a full course of instruction while the tax-supported institutions charge, on the average, about \$240.

Bigger Tax Bill in Prospect

A large increase in the total enrollment in our colleges and universities during the next decade is in prospect, particularly when the great increase in births during World War II is reflected in the number of young men and women of college age. With a total of 2.5 million students at present enrolled in our institutions of higher learning, it is estimated that the total will be over 3 million by 1960.

If this trend continues most of the anticipated increase in college and university enrollment will be concentrated in tax-supported institutions. Indeed, if the shift toward tax-supported institutions that has occurred in the last three years were to continue over the next six years at the same rate, about two million of the three million students anticipated in 1960 would be in tax-supported colleges and universities and

one million in independent schools. In 1950 there was a 50-50 division in enrollment. This shift would mean, of course, a corresponding increase in the tax bill for tax-supported education. And of this bill, we can be sure that an ample share would be assessed against business firms.

No Easy Solution

The best way, of course, to put a brake on a soaring tax bill for higher education is to help the independent institutions get in shape financially to carry a larger share of the student load. For most companies the development of a mutually satisfactory program of financial aid for higher education is a complicated process. In fact, it is so complicated that some companies with an initial disposition to provide financial help are inclined to despair of working out a mutually constructive plan.

If, however, the leaders of business will contemplate seriously the only available alternative to their extending voluntary help to our independent colleges and universities, their determination to work out a plan will be strengthened. For that alternative involves a grave weakening of our system of higher education, together with an involuntary increase in the financial support of higher education by business. The increase would come through higher taxes. Contemplation of such an alternative should, if necessary, toughen the will of business firms generally to do everything possible to extend financial help to our independent colleges and universities.

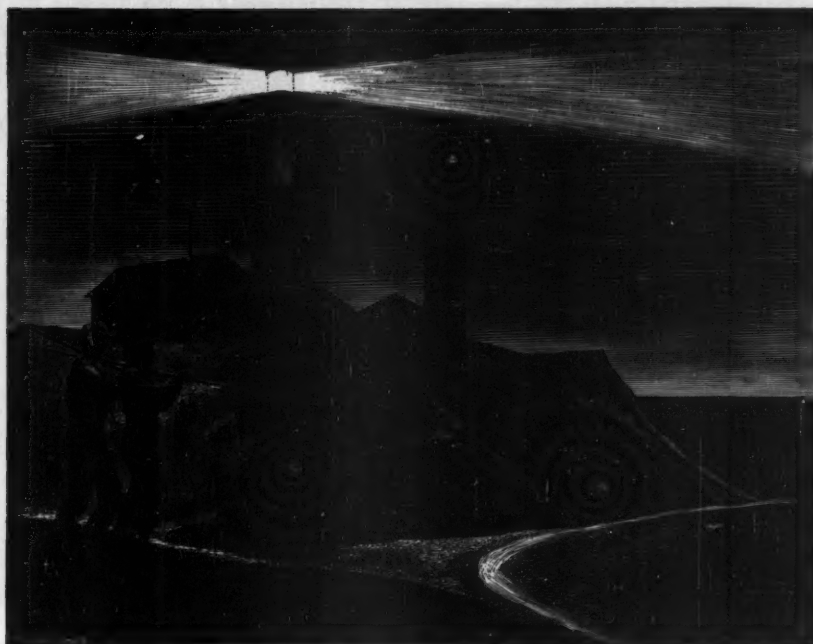
This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald McGraw
PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

FAMOUS LIGHTHOUSES OF AMERICA



MONTAUK POINT LIGHTHOUSE, completed in 1797, was one of the first to be constructed by the Federal Government following organization of the Lighthouse Service in 1789. Standing on a high headland of rocks and sand dunes, it marks the southern entrance to Block Island Sound as well as the eastern extremity of Long Island—an area of great danger to ships because of violent storms and the prevalence of fog.

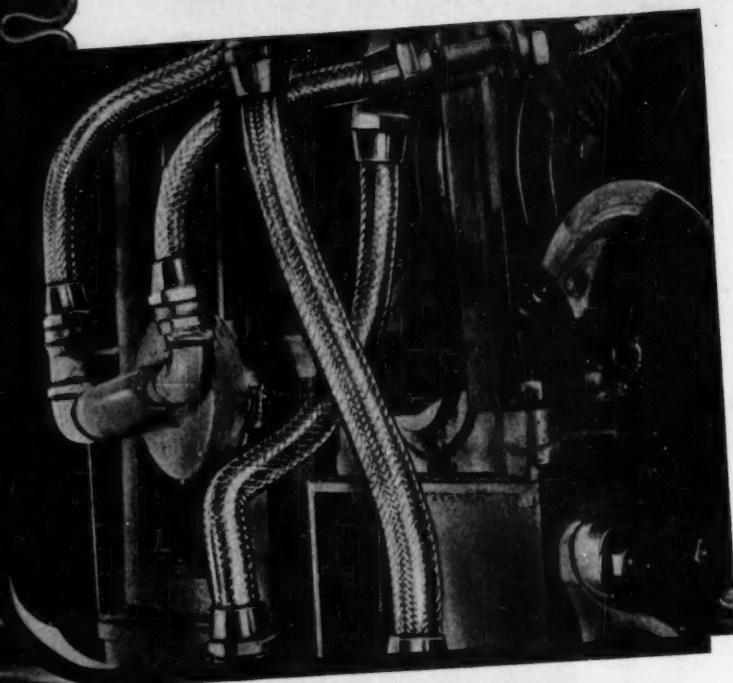
Safe passage through many channels of production has been provided to thousands of users of electrochemicals by the skillful cooperation of Niagara Alkali Company. Niagara is a pioneer in the development, production and application of these important chemicals:

Nialk® Liquid Chlorine, Nialk Caustic Potash, Nialk Carbonate of Potash, Nialk Paradichlorobenzene, Nialk Caustic Soda, Nialk TRICHLORethylene, Niagathal® (Tetrachloro Phthalic Anhydride).

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.

TAKES THE BREAKS OUT OF VIBRATING LINES



PENFLEXWELD

Corrugated . . . Flexible . . . Jointless Tubing

HERE'S A JOB just "made" for Penflexweld: the steam lines of a paper laminating machine. Steam pressure—100 psi . . . machine movement— $\frac{1}{4}$ " constantly . . . vibration—terrific. The Penflex Engineer recommended braided Penflexweld Tubing with Metseal couplings.

This actual application data came out of a big Mid-west paper mill. It can apply to your plant, too, wherever Penflexweld is called for in the high-pressure transmission of air, oil, steam, gases or volatiles. Penflexweld, the corrugated, all-metal welded tubing is flexible . . . resists bursting, crushing, breaking . . . is heat and flame-resistant . . . is "seep-proof" . . . absorbs vibration. Have you a job for it?

Send today for the new illustrated data book on "Flexineering"—the science of engineering flexible Penflex steel, bronze, or aluminum tubing ($\frac{1}{8}$ " to 24" I.D.) to your specific applications.

Pennsylvania Flexible Metallic Tubing Co., Inc.
7234 Powers Lane, Phila. 42, Pa. Branch Sales Offices: Boston
New York • Chicago • Houston • Cleveland • Los Angeles

PENFLEX

HEART OF INDUSTRY'S LIFE LINES



Production UP 30%
Steam costs DOWN 40%

You may not believe it... but we'll prove it!

When a prominent chemical manufacturer installed a Cochrane C-B System on a dryer for titanium dioxide, production went from 45 to 65 tons per day—a gain of 30%. Steam consumption decreased from 12,000 to 7,000 lbs./hr.—reducing steam cost 40%!

This example is not unusual. In process industries, paper board mills, laundries, or wherever steam is used for heat transfer, over 2000 Cochrane C-B Systems are setting new standards of production. Higher output, improved product quality, unbelievably improved equipment performance, longer service life, fuel savings, reduced maintenance... these are the benefits a Cochrane C-B System gives you. They all add up to increased production efficiency—a vital factor in insuring your

share of today's competitive markets.

Unless your condensate drainage is handled by a C-B "Closed System", it is almost certain that your steam and heat transfer equipment is *not* operating at maximum efficiency. By draining condensate at jet speed, the C-B System assures faster, more uniform heat transfer in both old and new equipment and gives outstanding savings by discharging steam at higher temperatures directly to the boilers or the make-up facilities.

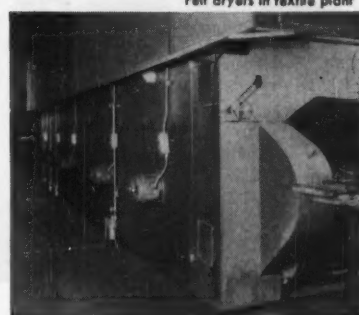
You may still be skeptical... but these are facts and these results mean money in your pocket. So, why not spend a few minutes to find out the complete story? Write us TODAY for Publication No. 6025 on C-B Condensate Drainage Control Systems.



Corrugator in paper board mill



Flatwork ironer in laundry



Felt dryers in textile plant



Cochrane
CORPORATION

3113 N. 17th STREET, PHILADELPHIA 32, PA.
 NEW YORK • PHILADELPHIA • CHICAGO

Representatives in 30 principal cities in U.S.; Toronto, Canada; Mexico City, Mexico; Paris, France; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii.

POTTSTOWN METAL PRODUCTS DIVISION—Custom built carbon steel and alloy products

COCHRANE CORPORATION

3113 N. 17th STREET, PHILADELPHIA 32, PA.

Send me a copy of Publication No. 6025 on Cochrane C-B Systems.

Name _____ Title _____

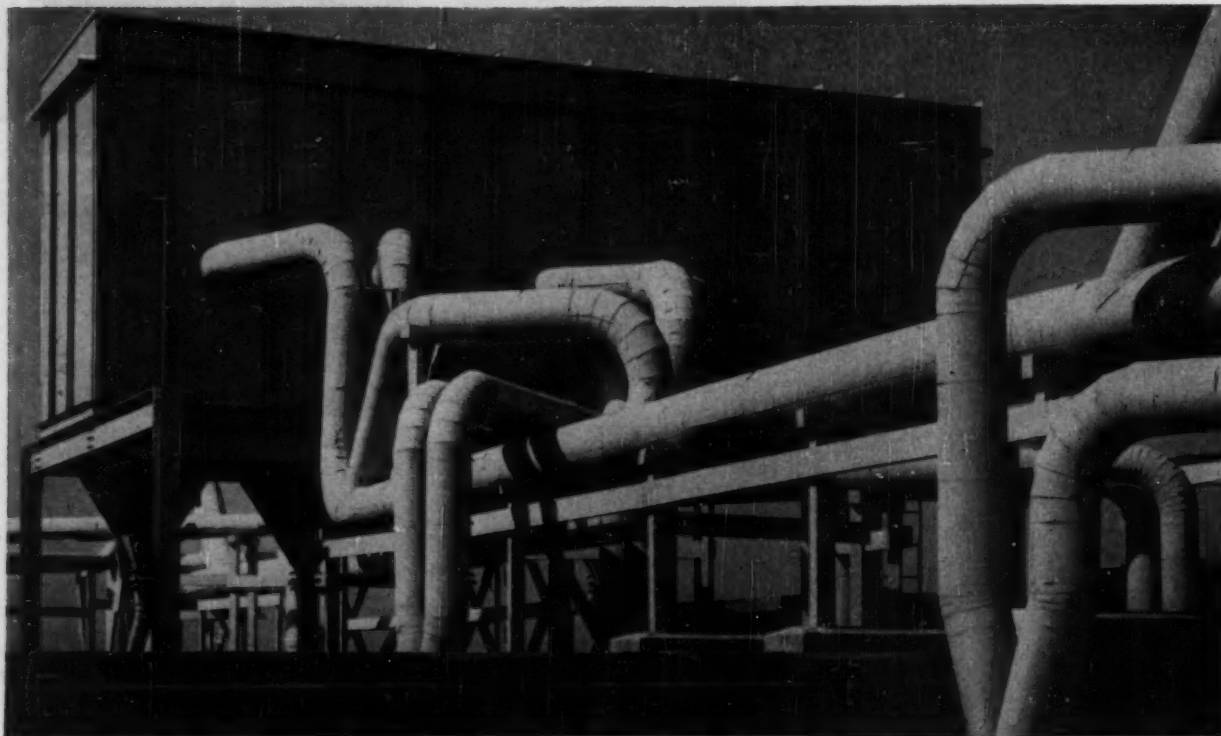
Company _____

Address _____

City _____ Zone _____ State _____

Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Specialties • Dealkalizers • Reactors • Deaerators • Continuous Blowoff • C-B Systems

pioneering developments keep DUSTUBE® first in dust control



ALL DUCTS LEAD TO COMPLETE DUST CONTROL

Virtually 100% Collection Efficiency Obtained With A Wheelabrator Dustube For Socony Paint Products Co.

Instead of dispersing into the atmosphere, dust created in the pigment grinding and mixing operations in the Metuchen, N. J. plant of Socony Paint Products Co., is effectively trapped in a Wheelabrator Dustube Collector. Without this complete protection the dust would be intolerable, forcing workers to wear respirators. The dusty pigments

are compounds of lead, chrome, titanium and other metals and synthetics more or less poisonous or at least annoying.

Secondary benefits include an improved purity of color in the finished paints by preventing contamination of one mixer by the dust of another, reuse of some dust in which qualities other than color are valuable assets, and re-

duction to a minimum of the time required for keeping plant areas clean.

But healthier, cleaner working conditions were the first consideration in installing a dust collection system, and the Socony plant now would not be without it.

Whether your problem is control of dust or fume for processing operations or whether it is one of recovering valuable materials for reuse, the high-efficiency cloth-tube system employed in Wheelabrator Dustube Collectors deserves your investigation.

WRITE FOR CATALOG 372 TODAY



trail blazer of industrial progress

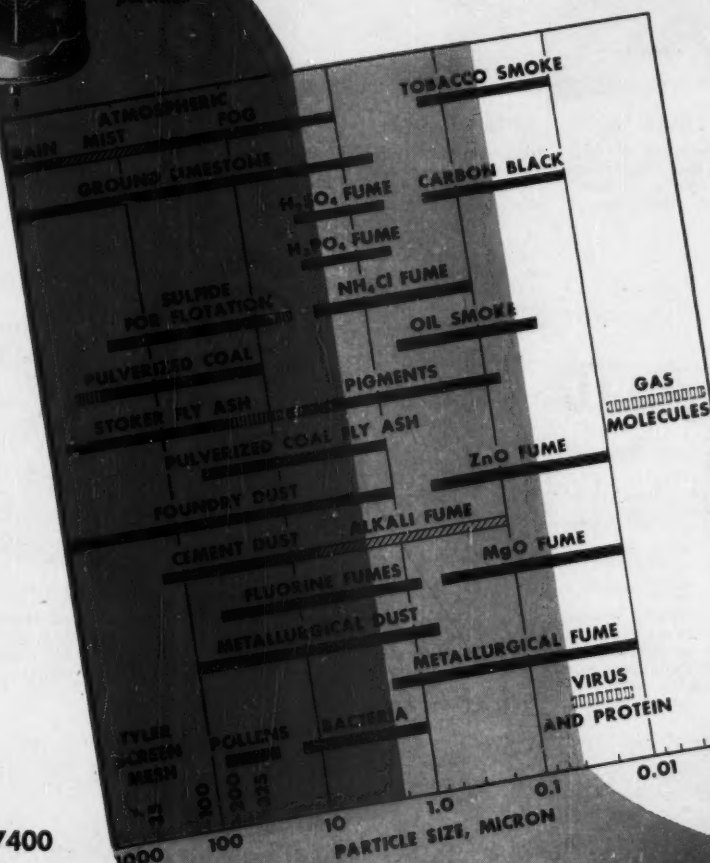
AMERICAN WHEELABRATOR & EQUIPMENT CORP., 347 S. Byrkit St., Mishawaka, Indiana

The first 2 steps to eliminate **DUST or FUMES**

in your plant

1 Pick out your dust or fumes in this chart of particle sizes to determine the type of P-A Scrubber to be used

CYCLONE TYPE
for Micron Size
particles



2

Phone MU 8-7400
or write our P-A
Sales Dept. for further
information, and ask for
our Bulletin M102 on
Pease-Anthony Gas Scrubber

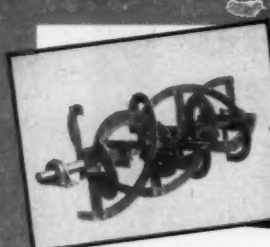
CHEMICAL CONSTRUCTION CORPORATION
A Unit of American Cyanamid Company
488 MADISON AVENUE, NEW YORK 22, N. Y.
Technical Representatives Throughout the World
Cables: CHEMICONST, N. Y.

VENTURI TYPE
for particles down
to Sub-Micron Size

CHEMICO (P-A) SCRUBBER

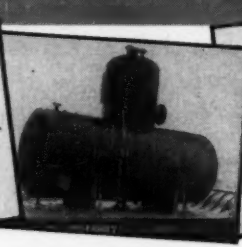


Here's A **Single Source** of **Supply** For so Many of Your Process Needs



MIXERS & AGITATORS

Types: turbine, propeller, paddle, anchor, finger, screw, ribbon, gate.
Service: For all single or multi-phase processes involving liquids, solids, pastes and gases.



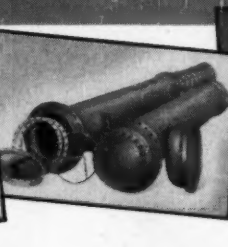
TANKS & PRESSURE VESSELS

Materials: carbon steel, the stainless steels, nickel, monel, inconel, hastalloy, clad steels.
Construction: ASME Code



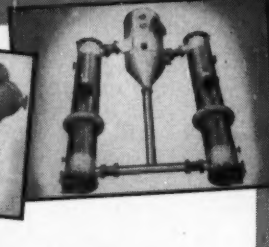
REACTORS & PROCESS UNITS

Processes: chlorination, fermentation, saponification, hydrogenation, nitration, sulfonation, polymerization, digestion, esterification, other organic syntheses.
Operations: crystallization, heat transfer, extraction, drying, distillation, evaporation, absorption, adsorption, concentration.



HEAT EXCHANGERS

Types: shell and tube, floating head, fixed tube sheet, U-band key fittings.



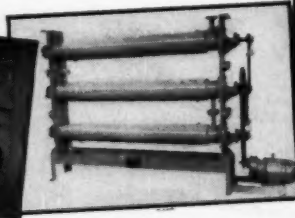
EVAPORATORS

Types: forced circulation, natural circulation, multiple-effect.



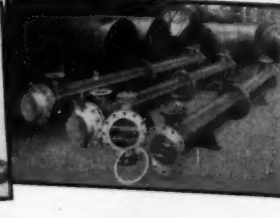
DISTILLATION COLUMNS

Types: bubble cap, packed, "turbogrid", special types.



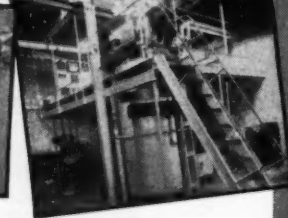
SPECIAL EQUIPMENT

Like chillers, crystallizers, paste mixers, cone and ribbon blenders, post mixers, vacuum pan dryers, paint reducing tanks.



CUSTOM FABRICATION

The Newark Plant of I*P*E is one of the largest and best equipped in the East. You get precision machine work and highest quality welding on everything from a simple tank to a complex mechanical unit. Facilities list available on request.



COMPLETE PLANTS

Scope: From process and equipment design, to fabrication and construction, to initial operation.

If you're in on the purchase specifications of plants and equipment, you know well the advantages of dealing with a *single source of supply* . . . one point of responsibility, uniformity of materials, similarity of parts. Your entire plant or process unit fits together better, runs more smoothly and gives you trouble-free service.

From the fabrication of vessels, agitators or precision machinery . . . to the engineering, design and construction of process units or entire industrial chemical plants . . . I*P*E offers you the *complete* service. Whatever your needs are, you'll get more help at lower cost from I*P*E. Write or 'phone today.

Are you getting I*P*E's bulletins on equipment design and construction?

They're free!

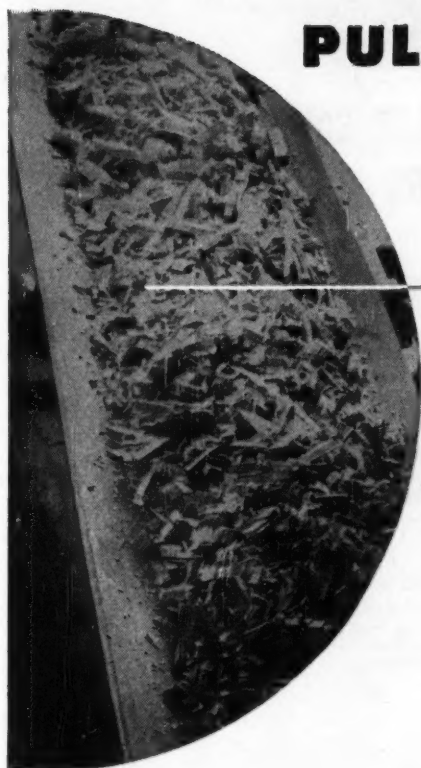
Write Today!



INDUSTRIAL PROCESS ENGINEERS

2 LISTER AVE., NEWARK 5, N. J.

ENGINEERS, DESIGNERS, MANUFACTURERS
OF PROCESSING PLANTS AND EQUIPMENT



PULPING COSTS GO DOWN!

with

AMMONIUM BISULPHITE Pulping

Leading mills have converted to the Ammonium Bisulphite Pulping Process because they found pulp production is increased, *while pulping costs go down.*

The changeover to this Pulping Process—pioneered by us—is inexpensive. A minimum replacement—and in many cases, no replacement—of equipment is involved, and there is practically no loss of production during conversion. Check the partial list of advantages below, then wire, phone or write us today. A member of our Technical Service staff will call, give you full details, facts and conversion methods. No obligation!

• **More pulp**—a higher proportion of acceptable pulp of increased freeness is produced, thus increasing the capacity of knotters, deckers, washers and fine screen equipment.

• **Better quality**—unbleached pulp is more uniform, stronger, brighter; has lower ash and lower screened speck count. Less bleach needed.

• **Saves steam**—superior penetration reduces cooking time and

maximum temperatures. Temperatures are lowered as much as 30°F!

• **Saves labor**—one ton of ammonia replaces *three* tons of limestone. Handling of limestone, scaling are eliminated.

• **Overcomes stream pollution**—waste liquor is *easily evaporated*; there is a greater recovery of heat and chemicals; while stream pollution is reduced to a minimum.



Anhydrous Ammonia

NITROGEN DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Hopewell, Va. • Ironton, Ohio • Orange, Tex. • Omaha, Neb.

Anhydrous Ammonia • Ammonia Liquor • Ammonium Sulfate
Sodium Nitrate • Methanol • Ethanolamines • Ethylene Oxide
Ethylene Glycol • Diethylene Glycol • Urea • Nitrogen Tetraoxide
Fertilizers & Feed Supplements • U.F. Concentrate—85
Formaldehyde • Nitrogen Solutions

NITROGEN DIVISION, ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

- ☐ Yes, please send me full details on your Ammonium Bisulphite Pulping Process.
- ☐ Please arrange to have your Technical Service Man call.
- ☐ No obligation.

Name _____

Title _____

Company _____

Address _____

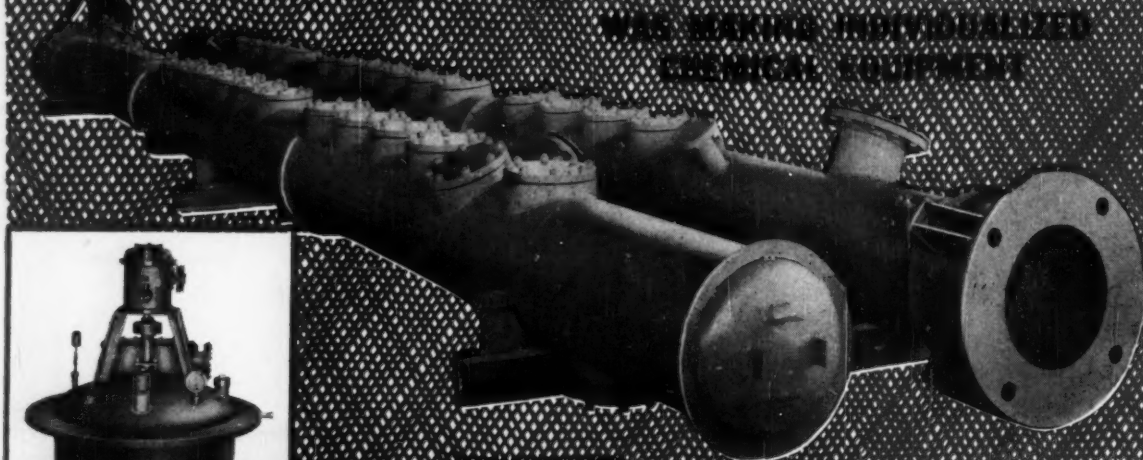
City _____ Zone _____ State _____ CE-2



WHEN JOHN PHILIP SOUSA WAS
LEADER OF THE MARINE BAND

Koven

MAKING INDIVIDUALIZED
CHEMICAL EQUIPMENT



High pressure mixing vessel

Everyone loves a parade—and through the years Sousa's stirring marches have become as indispensable to an American parade as a brass band. Industry has its important names also—names such as KOVEN, famous in the chemical industry for over 70 years for expertly fabricated equipment.

KOVEN's skilled craftsmen build each unit to fit a specific operation; thereby rendering production more efficient and more profitable—a prime factor in these days of technical complexities and mounting costs. Follow the lead of top-ranking chemical manufacturers throughout the country. Let KOVEN help cut your production costs with smooth-functioning KOVEN equipment—built to your exact needs. Call or write for a consultation—of course, there is no obligation. Send for Bulletin #550.

X-RAY INSPECTION FOR QUALITY CONTROL.

KOVEN equipment in all metals and alloys include: High pressure vessels, extractors, mixers, stills, kettles, tanks, stacks, breechings. Shop and field erected storage tanks. High vacuum testing.

L. O. KOVEN & BRO., INC.
154-A Ogden Ave., Jersey City 7, N.J.

Specialists In
STAINLESS STEEL
MONEL
NICKEL
ALUMINUM
INCONEL
ALL CLAD MATERIALS
FABRICATION TO ALL
A.S.M.E. CODES.

Plants:



Jersey City, N. J.



Dover, N. J.



Trenton, N. J.

KOVEN FOR INDIVIDUALIZED EQUIPMENT SINCE 1881



Floorstand equipped with Motor Unit . . . control panel, motor, limit switch and push button station.

Simple and **RUGGED...**

CHAPMAN'S MOTOR UNIT

**for Valves, Floorstands
and Sluice Gates**



Simple, durable mechanism of Chapman's Motor Unit. Handwheel remains stationary during motor operation.

Chapman Motor Units have fewer components than any other units, providing greater dependability, much lower maintenance costs.

There are only two pinions and two gears in the motor reduction train: drift is eliminated and lash is negligible. Your valves seat tight, but not too tight. Operation is *always* smooth and trouble-free.

You can mount the Chapman Motor Unit in any position, at any angle required. The rugged stub-tooth gears require no grease

or oil bath . . . yet run smoothly, quietly, with minimum wear.

Weatherproof and steam tight, Chapman's floorstand units are shipped completely wired, ready to connect to your power leads, for easy, rapid installation. This modern motor unit is dependable and economical. Send for *new* catalog No. 51.

**The CHAPMAN Valve
Manufacturing Company**
INDIAN ORCHARD, MASSACHUSETTS

There's a series of

NEW VIKING CATALOGS

just off the press
showing the way to answer your pumping problems

Which Catalog Interests You?

- | | |
|-------------------------------|------------------------|
| B-c General Purpose Pumps | F-c Sanitary Pumps |
| C-c Heavy Duty Pumps | G-c Oil Industry Pumps |
| D-c Underwriter Pumps | H-c LP-Gas Pumps |
| E-c Jacketed Pumps | I-c Hydraulic Pumps |
| J-c Special Application Pumps | |

Just check above and attach to your letterhead.

VIKING

PUMP COMPANY
Cedar Falls, Iowa

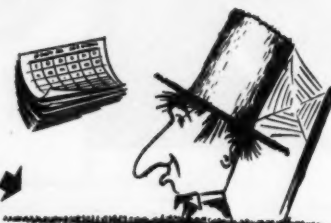
See Our
Catalog in
SWEETS

MAN WAITING FOR THE DUST TO SETTLE

In the past, whenever faced with a perplexing problem, the poor soul pictured here always "waited for the dust to settle" before making a decision. Often this is sound policy. But one day his plant developed a dust control problem, and after two years of waiting, he was up to here in dust.

Then he heard about our Model D AEROTURN* Dust Collector, and decided to take the plunge. Today he is a cleaner and a wiser man.

We aren't here to debate philosophies, but we do know about dust. We have carefully designed the Model D to provide high-efficiency filtering in the smallest possible space. An automatic, reverse-air-jet keeps the filter at peak



efficiency. No erection required. Shipped to you ready for operation. A built-in centrifugal pre-separator is available as an accessory. Unit capacities from 500 to 7200 CFM. Write today for the Model D AEROTURN Bulletin.

*Manufactured under Hersey Patent Rights. Other patents pending.

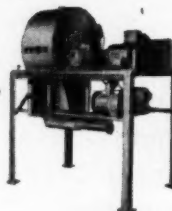
TURNER & HAWS ENGINEERING CO., Inc.
87 Gardner Street, West Roxbury 32, Massachusetts

Please send Bulletin 3027

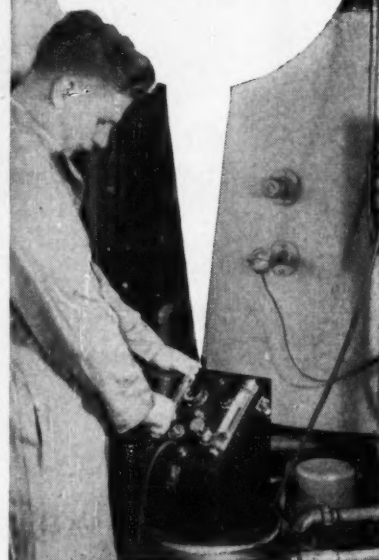
Name _____

Company _____

Address _____



read
dew points
INSTANTLY
...**ACCURATELY**



The Alnor Dewpointer takes the guesswork out of dew point readings... makes it easy, even for non-technical personnel, to achieve consistent accuracy. That's because fog is suspended in an enclosed chamber, under controlled conditions which can be reproduced time after time... anywhere. This means faster readings, too, with no time lost calculating variables. And the Alnor Dewpointer is completely self-contained, requires no external coolant or auxiliary apparatus. It operates on either a.c. or the enclosed battery. Available in three ranges... for dew points between -20°F . and room temperature, from -80°F . to -0°F . and from -80°F . to room temperature. For more information, send for your copy of the Alnor Dewpointer Bulletin. Illinois Testing Laboratories, Inc., Room 559, 420 North La Salle Street, Chicago 10, Illinois.



**PRECISION INSTRUMENTS
FOR EVERY INDUSTRY**

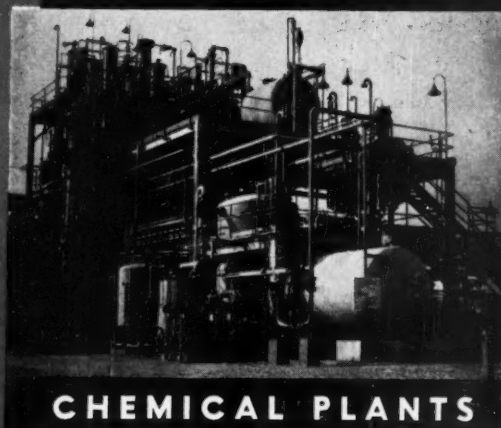
DROP FORGED STEEL
valves, fittings and flanges by

Vogt

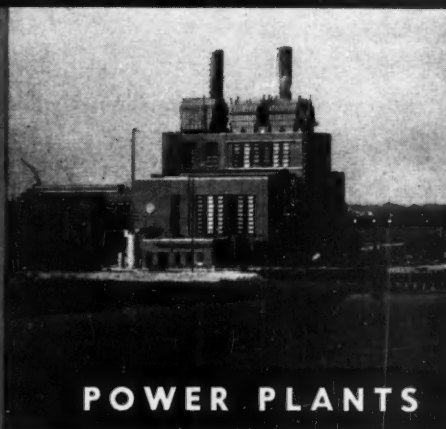
**USED
and TRUSTED
by the
NATIONS KEY
INDUSTRIES**



REFINERIES



CHEMICAL PLANTS

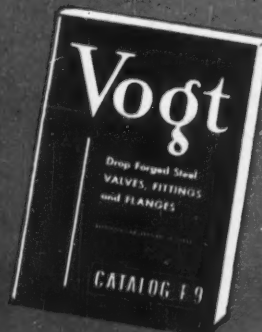


POWER PLANTS

There are good reasons behind the trust which America's key industries have placed in Vogt valves, fittings, and flanges for half a century. They know that *drop forged materials* are uniform in structure, fine grained, and free from porosity. They know, too, and appreciate the meticulous care given these products through every stage of forging and machining in Vogt's modern shops, and about the many rigid tests and inspections. And that is why these products enjoy such an impressive record of performance in withstanding the shocks and stresses imposed by high or low pressures and temperatures and in resistance to erosive and corrosive conditions.

Service is another important factor in this confidence because Vogt maintains the world's largest and most complete stock of drop forged steel valves, fittings, and flanges always ready for immediate shipment.

Write for Catalog F-9.
Consult its 400 pages for
the complete Vogt line of
drop forged steel valves,
fittings, and flanges for oil,
steam, water, air, gas, and
refrigeration services.

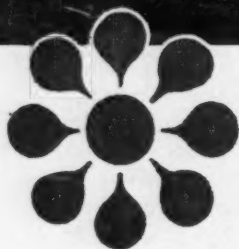


HENRY VOGT MACHINE CO., LOUISVILLE, KY.

BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland
St. Louis, Dallas, Charleston, W. Va., San Francisco



One of six 51-foot liquid chlorine horizontal storage tanks built and tested by Newport News to meet A.S.M.E. Code requirements. This pressure vessel was welded by Union melt machines. Pressure vessels undergo stress-relieving treatment in our ovens.



Large Units...

single or multiple

*Built with careful attention to detail
by specialists in Metal Fabrication*

Whether specified in alloyed or carbon steel, stainless, high nickel alloys or clad ... you'll find it pays to have Newport News fabricate your large units.

Avail yourself of the specialized production techniques, and the skill of Newport News craftsmen operating vast steel fabricating shops.

Units of large dimension are readily constructed by Newport News in a 225-acre plant that includes five huge, fully equipped machine shops, drop forging and die facilities, heat treating ovens, and

acres of brass, iron and steel foundries.

Moreover, modern testing apparatus, used for thorough investigation of materials and techniques, contributes to the excellence of Newport News fabrication. In addition, Newport News shop erection of fabricated units assures trouble-free assembly at your plant site.

Let us bid on your present or future projects. If you are not familiar with the way Newport News can help you, write for our booklet entitled "Facilities and Products"... it's yours for the asking.



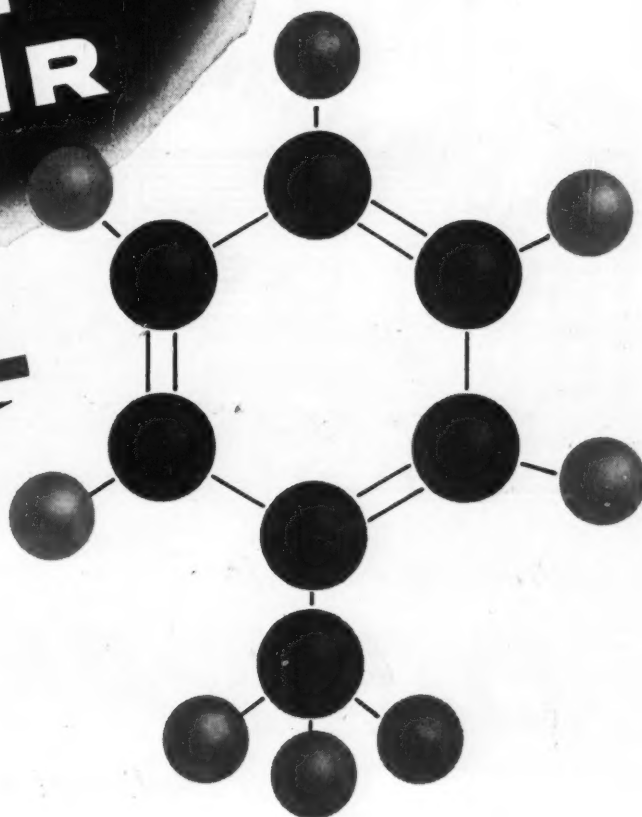
Newport News Shipbuilding and Dry Dock Company

Newport News, Virginia

now from
SINCLAIR

TOLUOL
XYLOL

and



Heavy Aromatic Solvents

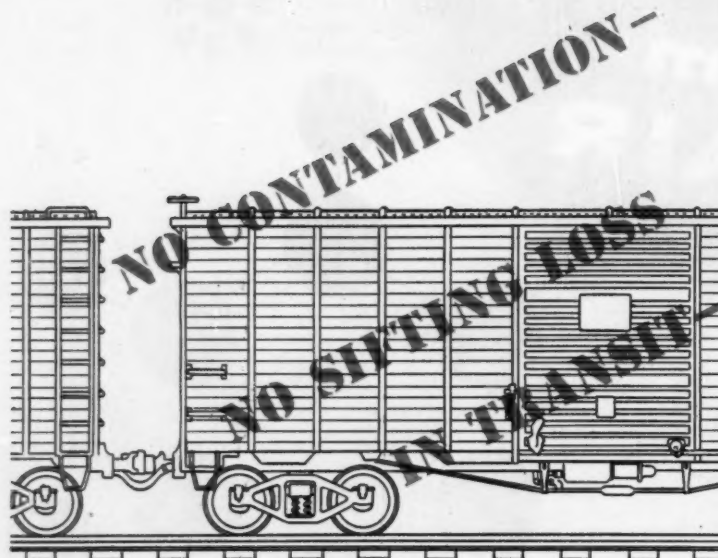
● Designed especially for quantity production of high purity aromatic hydrocarbons, including toluol, xylol and heavy aromatic solvents, the newest of Sinclair's chemical units is now being completed at Marcus Hook, Pa.

This new unit, which will provide a dependable supply of petro-chemicals for industry, will be in full production in March, 1955. Its operation marks another step forward in Sinclair's progress in the petro-chemical field.

If your manufacturing processes call for toluol, xylol or other aromatic hydrocarbons and solvents, be sure to investigate this new source of supply. Write or call —

SINCLAIR CHEMICALS, INC.

(Subsidiary of Sinclair Oil Corporation)
600 Fifth Avenue, New York 20, N. Y.



when you bag in

BAGPAK

Multiwalls

Bagpak Multiwalls assure constant, perfect protection against loss and contamination in transit and storage. Bagpak offers five basic types of Multiwall Bags for proper packing and shipping of every type of commodity:

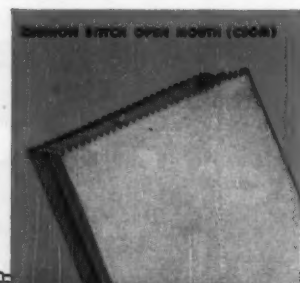
- Cushion Stitch Open Mouth (CSOM)
- Sewn Valve (SV)
- Pasted Valve (PV)
- Pasted Open Mouth (POM)
- Automatic (SOS)

Bagpak Multiwalls are saving time and money, piling up profits for manufacturers the country over.

To find out how Bagpak Multiwalls can paint a better profit picture places you under no obligation.

Just write: K-21.

International Paper Company, Bagpak Division
220 E. 42 Street, New York 17



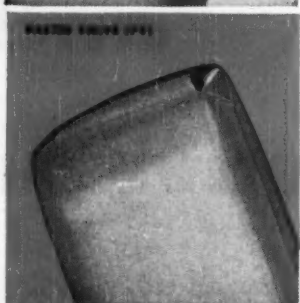
SEWN VALVE (SV)



PASTED OPEN MOUTH (POM)



PASTED VALVE (PV)



AUTOMATIC (SOS)




International Paper COMPANY
 BAGPAK DIVISION

BRANCH OFFICES: Atlanta • Baltimore • Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver • Des Moines • Detroit • Joplin • Kansas City, Kansas • Los Angeles • Minneapolis • New Orleans • Philadelphia • Pittsburgh • St. Louis • San Francisco • IN CANADA: The Continental Paper Products, Ltd., Montreal, Ottawa, Toronto

You name it-MOYNO® pumps it!



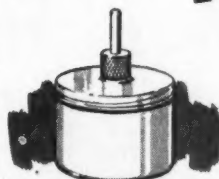
Foods

Potato salad, chow mein, peas, cream-style corn, tomatoes, molasses, chocolate.



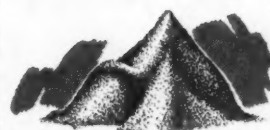
Chemicals

Caustics, acids, dyes, petroleum solvents, soaps, sludges, latex, synthetic resins.



Pastes

Paper coating, starch, seam paste, size, adhesive dope, heavy grease, graphite sludge.



Abrasives

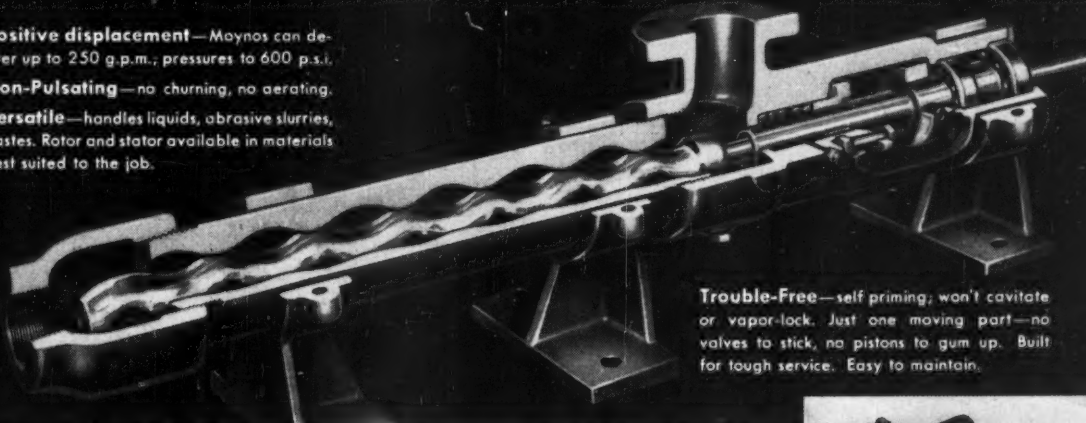
Insulator clay, frit, ground glass and water, porcelain glaze and enamel, cement, plaster.

FEATURES OF THE MOYNO THAT MAY SOLVE YOUR MATERIALS-HANDLING PROBLEM

Positive displacement—Moynos can deliver up to 250 g.p.m.; pressures to 600 p.s.i.

Non-Pulsating—no churning, no aerating.

Versatile—handles liquids, abrasive slurries, pastes. Rotor and stator available in materials best suited to the job.



Trouble-Free—self priming; won't cavitate or vapor-lock. Just one moving part—no valves to stick, no pistons to gum up. Built for tough service. Easy to maintain.

R & M Moynos handle almost anything that can pass through a pipe

The Moyno is a problem-solving pump. And whether your problem is one of materials, maintenance or flow, there's a better-than-even chance that the Moyno is the pump you're looking for.

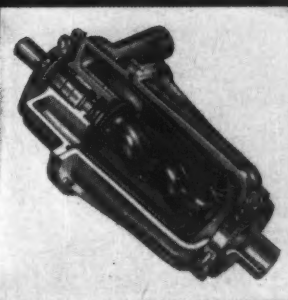
Here is a completely different kind of pump that handles almost anything that will push through a pipe, from free-flowing liquids to non-pourable pastes—even materials containing relatively large particles or abrasives.

This is how the Moyno works: a screw-like rotor turning within a double-threaded stator creates cavities which progress toward the discharge end of the pump, carrying the material being handled. The result is a

smooth, steady flow, free from pulsation and turbulence.

The pumping elements of the Moyno are available in a wide range of materials, depending upon the substances to be pumped. From stainless steels and synthetic rubber to tool steels, bronze, plastics—there is a Moyno that will do the job you want, and do it with remarkable efficiency.

Industrial-type Moynos are available with capacities to 250 g.p.m.; pressures to 600 p.s.i. Small Moynos (see inset), used as original equipment, serve on washers, water pumps, sprayers, and many other products.



FREE... this informative bulletin

Tell us your pumping problem—let's see how the Moyno can help solve it. If necessary, we'll be glad to run tests for you in our own laboratories. In any case, get the details on the Moyno—mail the coupon below.



ROBBINS & MYERS, INC.
SPRINGFIELD, OHIO • BRANTFORD, ONTARIO



Fractional and Integral HP Motors



Desk, Window, and Household Fans



Hoists and Cranes



Moyno Pumps



Propellair Industrial Ventilating Equipment

Robbins & Myers, Inc.
Pump Division, Springfield, Ohio
Please send Bulletin 30C on Moyno Pumps

(CE)

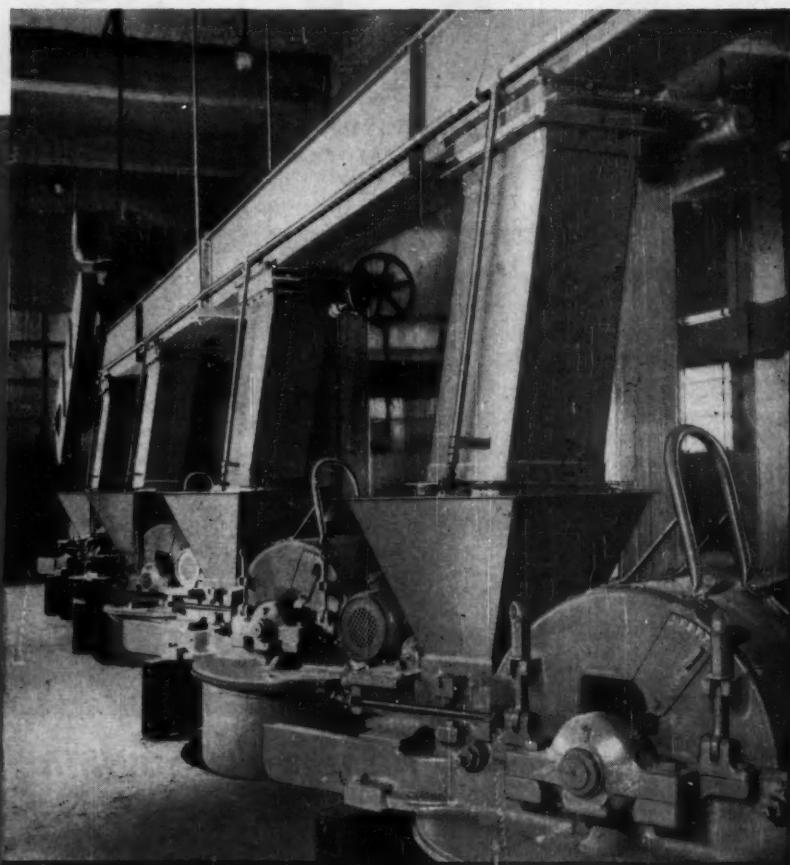
Name _____ Title _____
Company _____
Address _____
City _____ State _____

Viva Mikro-D! It Helped Mexico Make More and Better Tortillas!

New World Way

Section of a battery of
MIKRO-D PULVERIZERS
grinding tortilla flour in
a plant in the suburbs of
Mexico City.

(Photo by Mary St. Albans)



Old World Way



There's a revolution going on south of the border . . . a peaceful one . . . and we are proud to have supplied the "heavy munitions".

For centuries the corn meal for tortillas, the substitute for bread in our sister republic, was ground in the village mill or by the housewife with her own crude implements. Today it is mass produced in better quality, and Mexican folks are enjoying the obvious benefits of modern food engineering.

One plant alone in the suburbs of Mexico City is turning out a minimum of 600,000 pounds of corn meal per day by a patented process. And every ounce of it is ground and blended in a battery of 19 MIKRO-D PULVERIZERS.

Through meritorious service such as this, the tradename MIKRO-D has come to stand for a better product, in greater volume, at lower cost, not alone in the food field but in the chemical, drug, cosmetic and allied industries.

Why not let our engineers work on your problem? The facilities of our laboratory are yours to command without charge or obligation

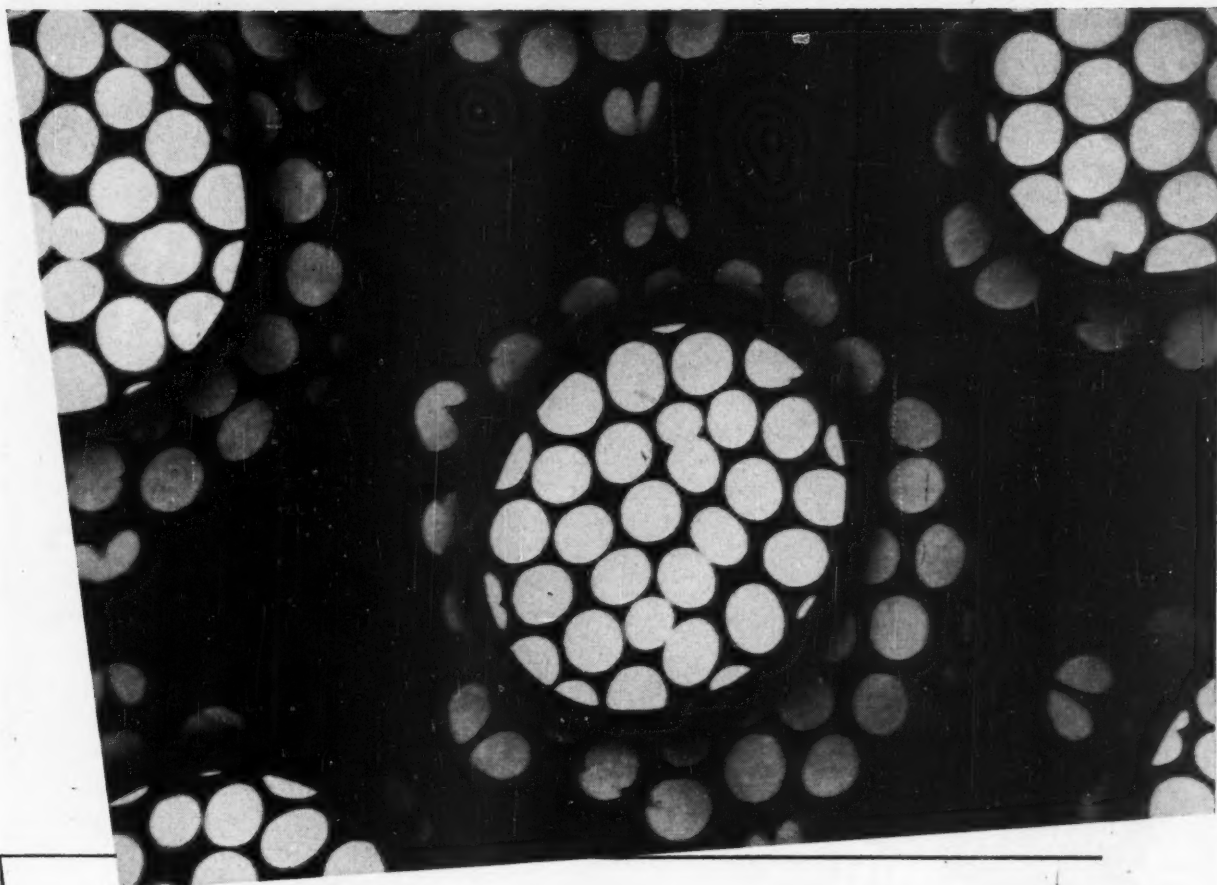
Mikro-D
PULVERIZER

PULVERIZING MACHINERY DIVISION
METALS DISINTEGRATING COMPANY, INC.

97 CHATHAM ROAD

SUMMIT, NEW JERSEY 3010

PULVERIZING • AIR CONVEYING • DUST COLLECTING EQUIPMENT



22,000 times as big as life

to show one why of Dicalite's
"sharp" filtration

This electron micrograph of one of the more than 10,000 kinds of diatoms shows clearly the delicate, yet rigid, "skeleton" whose lace-like grid helps make diatomite such a superior filteraid. Imagine, for a moment, millions of these diatom frustules—needle-, disc- or boat-shaped—piling up strawpile fashion in the filter pre-coat or filtercake . . . then visualize bacteria or other sub-micron sized solids (enlarged to the same scale) coming against this barrier. Now, in your mind's eye, you can see clearly how the

diatomite "grillwork" catches and holds all solids, while the fluid being filtered flows rapidly on through the billions of tiny channels which make up 90% of the filtercake's bulk.

Many processes and products in the chemical, industrial, food and pharmaceutical fields would be practically impossible without this "sharp" filtration provided by high-quality diatomaceous filteraids such as Dicalite. These Dicalite filteraids, processed under rigid controls from the highest quality diatomite, afford a complete range of uniform, sterile, chemically-inert products for the filtration of almost any liquid. They have provided the answers to many processing problems—they could well be the answer to yours. We will be glad to furnish full information, samples adapted to your requirements, or technical engineering aid if required.

Dependable
GLC
GREAT LAKES
Dicalite[®]
DIATOMACEOUS MATERIALS

DICALITE DIVISION GREAT LAKES CARBON CORPORATION • 612 S. FLOWER ST., LOS ANGELES 17, CALIFORNIA

CHEMICAL ENGINEERING—February 1955

331



on Allegheny Metal Plates

**For certified data on
individual grades of
Stainless Steel, use**

ALLEGHENY LUDLUM BLUE SHEETS

There is a Blue Sheet for each individual grade of Allegheny Metal, giving full information on its physical and chemical properties and characteristics. Let us send you this certified, laboratory-proved data on the stainless grades in which you are interested.

ADDRESS DEPT. CE-62

WRITE FOR YOUR COPY!

For any job which involves the handling of large volumes, heat and high pressures—either singly or all at one time—Allegheny Metal solid or clad plates are produced in the exact stainless grade required to combat corrosion, oxidation and contamination of the product.

Some of these grades are *new* . . . comparatively recent developments of our research and experience as a pioneer and leader in stainless steel production.

Others are improved versions of older analyses. The latest information on the entire subject of stainless plates is available to you in the booklet illustrated above—32 pages of valuable data on types, sizes, finishes, fabricating methods and uses, including ASTM and ASME boiler codes.

Specify "Allegheny Metal" for complete reliability in stainless steel plates, and write for your copy of the A-L Plate Book. ● Address Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.

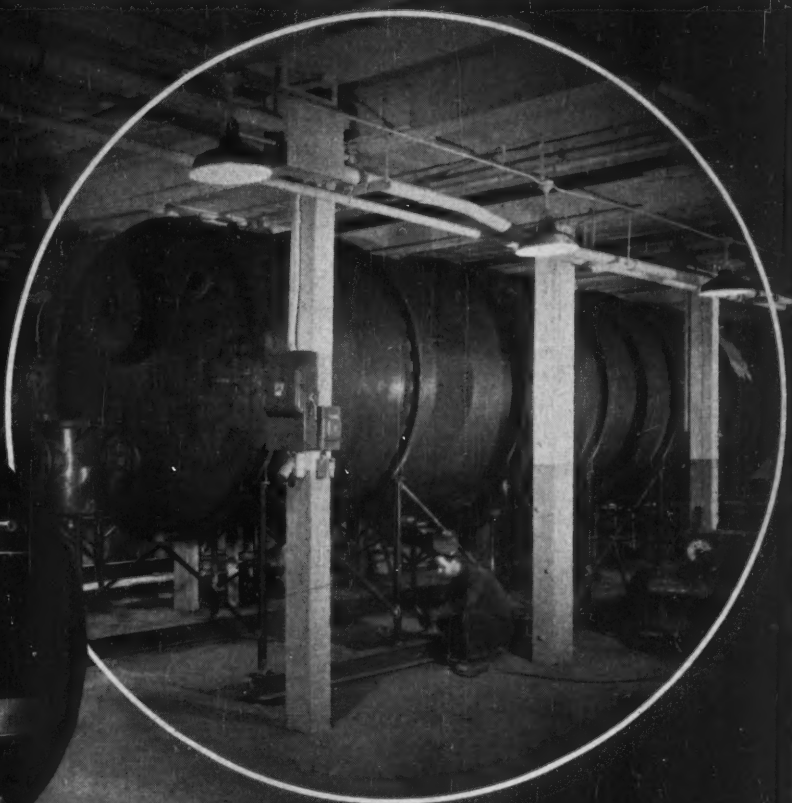
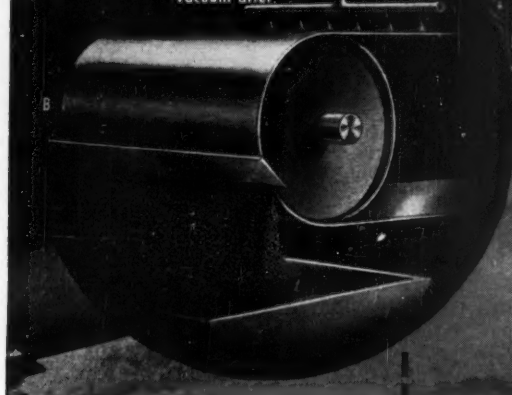
You can make it **BETTER** with
Allegheny Metal



W&D 4877

For Continuous Processing

Simplified illustration showing feed and discharge end of steel-belt conveyor in continuous vacuum drier.



Outside view of Vacuum Belt Drier used in processing Holiday Brand soluble coffee.

THEY DESIGNED A SANDVIK STEEL-BELT CONVEYOR INTO A HIGH VACUUM

**Steel Belt Withstands
Continuous Scraper Action,
Heat and Moisture In
This Vacuum Drier**

In this application, the special abilities of a Sandvik steel-belt conveyor have opened another door to better processing.

It's been the same story in plant after plant. Whether operating as independent units or integrated into special processing equipment, Sandvik conveyors keep on providing new and better answers to processing problems.

BASIC ADVANTAGES—Sandvik conveyors have a solid band of flat, stainless or carbon steel. This provides a smooth, hard, impervious surface that is easy to keep clean, has a high load capacity and a long service life. It can be fitted with simple discharge devices that scrape material off at any point. It can be used to convey materials through ovens. Belts can be of any length or width.

COOLING ARRANGEMENT—Sandvik conveyors can be built with a patented water-bed arrangement which cools from beneath . . . no water gets on top of the band. You can cool and convey, regulate thickness while cooling, cool and strip off gelatinous materials in sheet form, cool loose and pulverized materials, cool solids in sheet form and cool materials in layers.

ENGINEERING HELP—Sandvik's engineering department will be glad to work with you in determining where and how a Sandvik conveyor can improve your processing. Sandvik designs and builds complete conveyors to fit specific jobs.

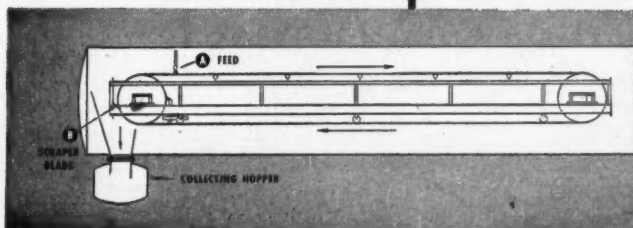
Write, wire or phone for further information.

SANDVIK STEEL, INC., Conveyor Division
111 Eighth Avenue, New York 11, N. Y., WAtkins 9-7180
Manufacturers of Steel Belt Conveyors for Over Thirty Years

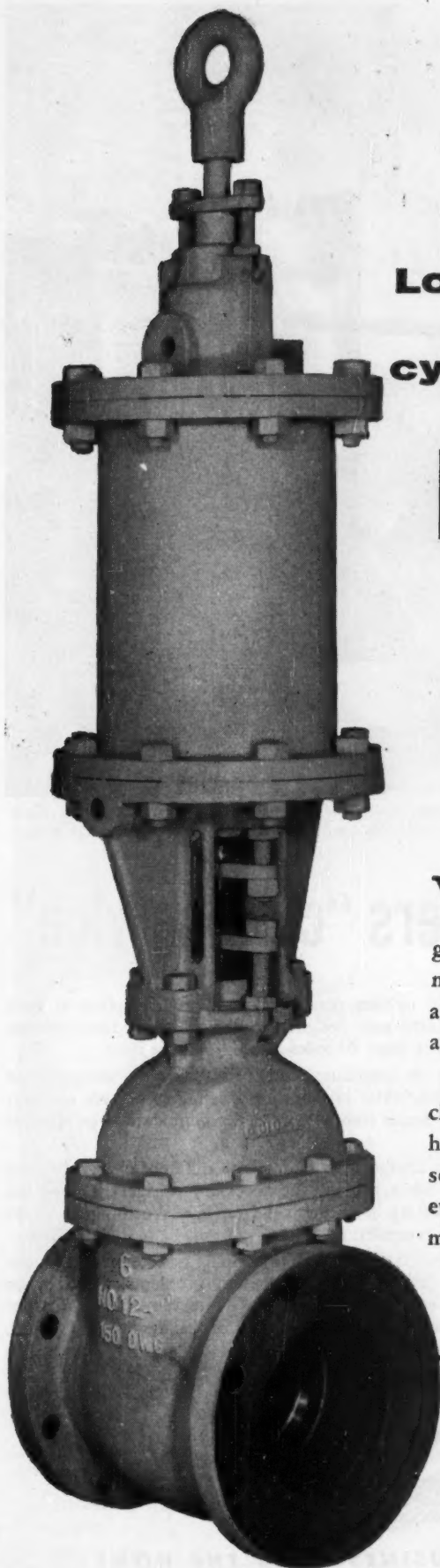
SANDVIK



**STEEL
BELT
CONVEYORS**



Schematic drawing shows how Sandvik conveyor operates in soluble coffee continuous vacuum drier designed and built by National Research Corporation for Holiday Brands, Inc. Concentrated coffee solution is sprayed on belt at point A and solidifies on the band as it travels the entire length of the conveyor and returns to point B. Here a scraper blade removes the crystallized coffee off the band into the collecting hopper.



Look how this

cylinder-operated gate valve

... SAVES TIME

... AVOIDS TROUBLE

... CUTS MAINTENANCE

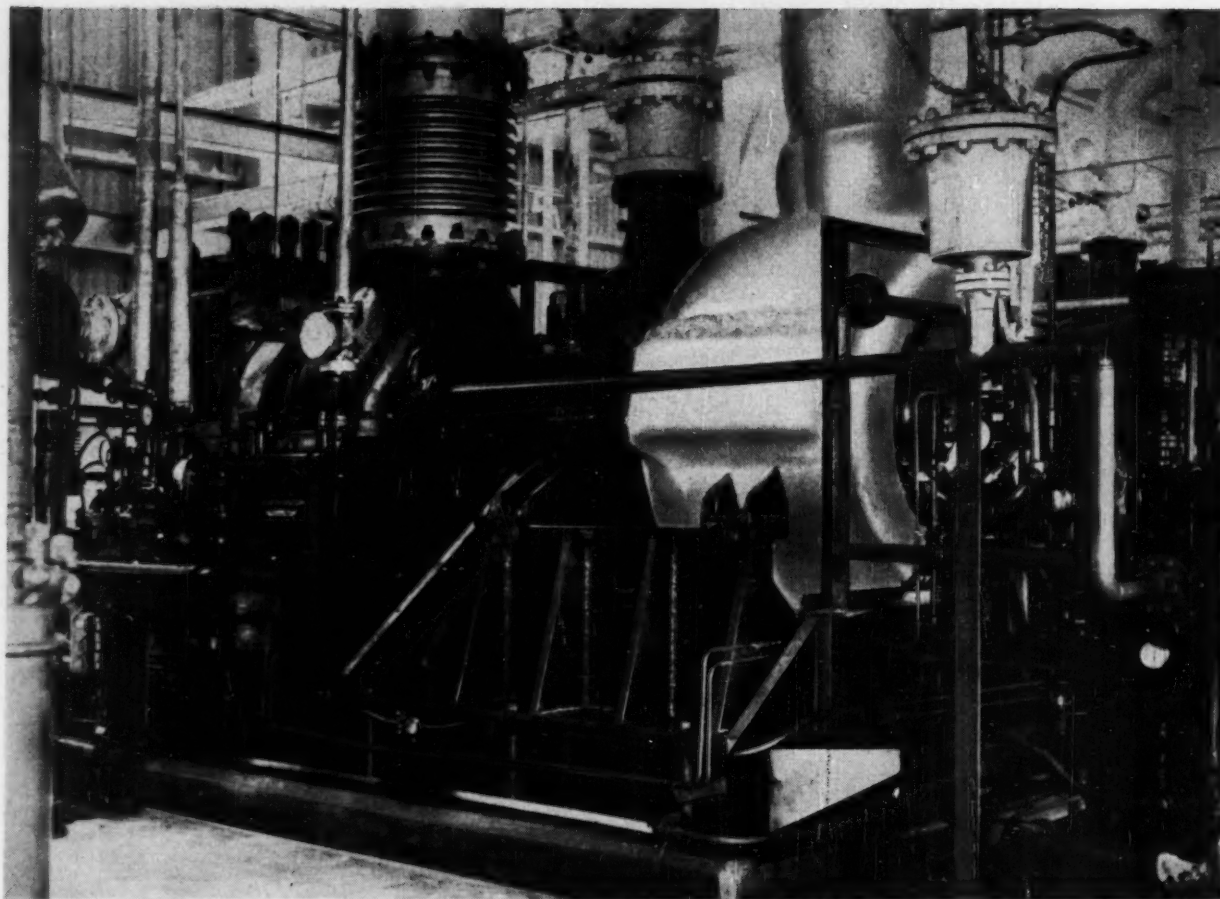
WHERE frequent operation is required... especially in inaccessible locations... Darling cylinder-operated gate valves save time on each cycle of operation. The valve may be operated by air, oil or water. Movement is precise and completely controllable. Action can be either manual or automatic. Control can be either local or remote or both.

Darling's double disc gate valve principle assures tighter closing and longer, service-free life. The fully revolving discs have a wiping action that keeps seat faces clean. The discs seat in a different position with each cycle so that wear is evenly distributed. Available in a broad range of sizes and materials. Write for complete details.

DARLING VALVE & MANUFACTURING CO.

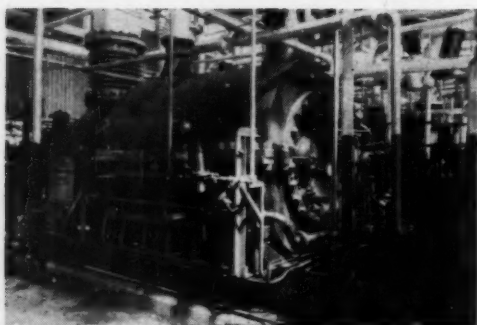
Williamsport 3, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario



WORTHINGTON CENTRIFUGAL REFRIGERATION COMPRESSOR in Gulf's new ethylene plant. Nozzles are for interstage bleed which boost discharge flow to four times initial suction flow.

New Gulf ethylene plant offers "curb service"



HANDLING CHARGE GAS at Gulf plant keeps this Worthington centrifugal compressor busy. Water injection nozzles control temperature, prevent co-polymerization.

Gulf Oil's new 180 million pound-per-year ethylene plant at Port Arthur, Texas, is the first ever designed to deliver its products directly to consumers—some of them 80 miles away—by *pipe line!*

It's also the first to use centrifugal compressors (by Worthington) for charge gas compression, water injection for cooling to prevent co-polymerization and multi-nozzle compressors to accommodate large bleed-in loads.

Three Worthington compressors handle five different charge streams in the process. Two more provide the necessary refrigeration for the process. Power—19,850 hp in all—comes from five Worthington steam turbines and one gas expander.

For over 50 years Worthington has been helping petroleum and chemical processing men with knotty refrigeration problems. Check your Worthington district office about yours—or write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.5.30, Harrison, N. J.

A.5.30.CG

"SEE the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

WORTHINGTON



CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

**JENKINS REGRIND-RENEW
PLUG TYPE VALVES
WITH**

500 BRINELL

Armor Seat

**Armored against
valve-killing close control
of steam . . . and abrasion**

Plug and seat ring are Jenkins JX500, a stainless chromium alloy steel made to Jenkins high strength specifications, heat-treated to 500 Brinell hardness. Seating surfaces are super-hard and mirror-smooth, offer highest resistance to galling, cutting, abrasion, and erosion . . . and "wire drawing" effects of close regulation of steam.

**300 lb. 200 lb. 150 lb.
Globe and Angle**

SOLD
THROUGH
LEADING
DISTRIBUTORS

Call your Jenkins Valve Distributor, and ask for Form 202,
or write: Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND



**NOW-Make
Your Own
Oxygen and
Nitrogen in
One Generator**

*... and Save
Up to 50%!*



Liquid
Oxygen
Pump
↓

With INDEPENDENT'S newly-designed generators, you can make your own high-purity oxygen and nitrogen from the free air . . . and in the same generator.

You reduce costs up to 50% by eliminating handling costs . . . vaporizing costs . . . evaporation losses . . . residual losses . . . and transportation costs.

INDEPENDENT Generators are available in any capacity, any purity and any pressure. Put your oxygen-nitrogen problem up to us . . . our engineering department will gladly submit recommendations . . . no obligation, of course!

INDEPENDENT ENG. CO., Inc.

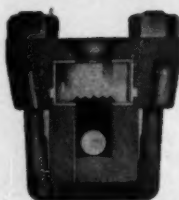


O'FALLON 7, ILLINOIS

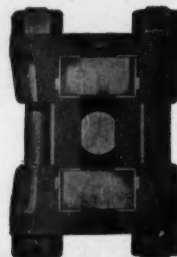


Strahman
LIQUID LEVEL GAUGES

**REFLEX
THRU VISION
TUBULAR**



Standard Equipment
in
Leading Refineries
and
Industrial Plants
All Over the World!



Send for Complete Catalog and Specifications

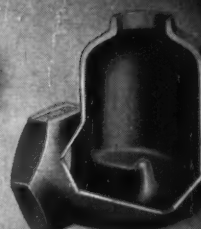
STRAHMAN VALVES, INC., 16 HUDSON STREET
NEW YORK 13, U. S. A.



FULL CONE



FLAT SPRAY



HOLLOW CONE

**SPRACO
NOZZLES**



Write for NOZZLE CATALOG to
SPRAY ENGINEERING CO.
115 CENTRAL STREET • SOMERVILLE 45, MASS.

Craters
on the
moon?



No, they're bubbles made of ALCOA Alumina by The Carborundum Company

Illustrated above is a cross-sectional view of something new in lightweight refractory material, a castable high-temperature cement made from ALCOA Alumina by The Carborundum Company, Perth Amboy, New Jersey. It's one of the world's best insulators in the upper temperature ranges of furnace operations. Mixed with water, the castable containing these pure alumina bubbles can be poured, begins to harden almost immediately thereafter.

Because ALCOA Alumina is so highly refractory, these cements withstand from 2800° to 3100°F depending on the type used. And, because ALCOA Alumina is one of the most stable and inert materials in existence, these cements show

little or no shrinkage even at extreme heats . . . are inherently resistant to furnace atmospheres and combustion gases. Further, because of dead air space in the thousands of tiny alumina bubbles, you get an excellent insulator, one that lets a furnace heat up fast.

Carborundum finds that alumina bubbles can be used almost anywhere you need a top-quality refractory with the convenience of a castable. Back-up linings for nonferrous melting furnaces . . . burner blocks for core ovens . . . boiler furnaces . . . malleable annealing furnaces . . . side-wall back-ups. These bonded alumina bubbles are also offered as prefired brick and in special shapes.

If you are looking for *better* refractory

performance at higher operating temperatures, look for refractories containing ALCOA Alumina. You'll find they last longer, require fewer tear-downs, are actually most economical.

ALCOA does not make refractories, but we will gladly discuss with you the properties and characteristics of the various ALCOA Aluminas. Write to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 702-B Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA 
CHEMICALS

ALUMINUM COMPANY OF AMERICA

CLAD STEEL WEIGH TANKS GUARD PLASTIC PROCESSING

Provision of economical, efficient, automatic weighing for chlorinated hydrocarbons presented a problem for this plastic processor. Discoloration and other contamination of the sensitive chemicals had to be avoided, and sub-zero temperatures were necessary to maintain their stability. So the company's engineers designed jacketed weigh tanks on suspended scales, allowing for circulation of coolant between the shells. Nickel-clad steel was specified as the *most economical* means of providing all the desired benefits in the inner shell.

The 20% layer of nickel cladding—permanently and integrally bonded to low-cost carbon steel backing plate—assures the corrosion resistance of solid alloy. There can be no discoloration of the sensitive plastic because of metallic pick-up, and smooth, inside clad surfaces are easily cleaned. Maintenance costs have been low since this equipment was placed in operation in 1947. Nickel-clad steel also gives the fast, uniform heat transfer so critical to the process. Rounded tops and all-welded construction provide strength; the 1/2"-thick clad steel walls do not warp or distort under pressure.

Whatever demands *your* processing places on tanks and pressure vessels, a wide range of clad steels will give you these benefits economically. You can profit by asking your fabricators' assistance *early* in your planning. Working with your engineers and consultants, a *qualified* equipment builder can help tailor clad steel tanks and vessels to your exact needs. They minimize first cost and assure long, trouble-free service life.



Corrosion-resistant nickel-clad steel in this battery of jacketed weigh tanks prevents contamination of vinyl plastics during processing.

Ask one of your fabricators to show you the new Lukens clad steel movie, "Equip for New Profits." Here—in full color and sound—are factual accounts of how clad steel equipment brings new economies. The story can suggest new ideas to everyone concerned with production efficiency. Or, contact Manager, Marketing Service, Lukens Steel Company, 749 Lukens Building, Coatesville, Pa.

LUKENS

CLAD STEELS

STAINLESS-CLAD • NICKEL-CLAD • INCONEL-CLAD • MONEL-CLAD

PRODUCER OF THE WIDEST RANGE OF TYPES AND SIZES OF CLAD STEELS AVAILABLE ANYWHERE

Are You in one of these 45 Industries that use *High Purity*



Crystal Urea?

(CARBAMIDE)

Purity of raw materials is always important for quality control of final products. It is especially valuable when you can get these high purity materials for your special uses!

Nitrogen Division Crystal Urea is made to meet rigid specifications . . . and at no extra cost to you.

Nitrogen Division Crystal Urea is made synthetically at two modern plants. It is always of the same high quality.

Fast Delivery Is Assured! Carlot and trucklot shipments are made directly from stocks maintained at new producing plants in Ironton, Ohio, and Omaha, Nebraska. LCL from warehouse stocks at Passaic, New Jersey; Chicago, Illinois; Providence, Rhode Island; East St. Louis, Illinois; Charlotte, North Carolina.

Nitrogen Division Crystal Urea is packed in 100-lb. moisture-proof, multi-wall paper bags.

Anhydrous Ammonia • Ammonium Sulfate • Methanol
Ammonia Liquor • Sodium Nitrate • Ethanolamines
Ethylene Oxide • Ethylene Glycol • Diethylene Glycol
Urea • U.F. Concentrate-85 • Nitrogen Tetroxide
Nitrogen Solutions • Fertilizers & Feed Supplements
Formaldehyde

NITROGEN DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Hepwell, Va. • Ironton, Ohio • Orange, Tex. • Omaha, Neb.

Adhesives

Agriculture

Analysis

Automotive

Aviation

Brewing

Cellulose

Ceramics

Chemical

Construction

Cosmetic

Dental Products

Detergents

Disinfectant

Distilled Liquor

Dye

Electrical

Explosives

Fats & Oils

Fermentation

Fertilizer

Finishes

Firefighting

Food

Glue & Gelatin

Inks

Insecticides

Leather

Matches

Medicine

Metallurgy

Oral Hygiene

Paint & Varnish

Paper

Petroleum

Pharmaceutical

Photography

Plastics

Refrigeration

Resins

Rubber

Soap

Textile

Wine

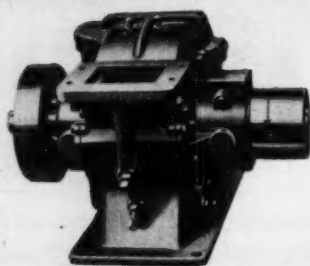
Wood

U. F. Concentrate -85!

Highest Concentration Liquid Formaldehyde Available commercially—59% Formaldehyde, 26% pure Urea in water solution.

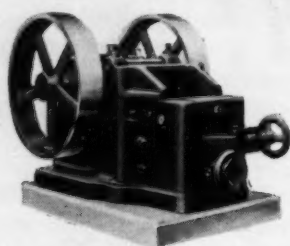
Costly excess water has been squeezed out. High costs too have been squeezed out. It increases productive capacity by increasing the effective charge and decreasing cycle time. Send for informative booklet!

STURTEVANT



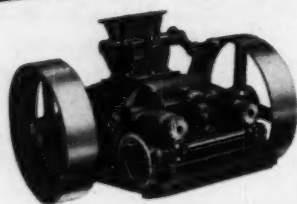
LABORATORY SWING-SLEDGE MILLS

Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



LABORATORY JAW CRUSHERS

Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 to 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.



LABORATORY CRUSHING ROLLS

First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited out-puts. Range of output for the 8 x 5 size is from 1/4 in. to 20 mesh — and for the 12 x 12 size from 3/4 in. to 20 mesh.

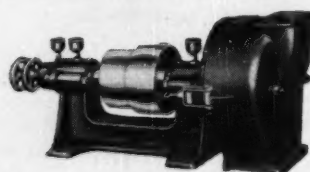
Laboratory Equipment...

assures accurate samples... cuts laboratory sampling costs

Sturtevant laboratory equipment have all the features of full-sized production machines with extra accuracy and wider range of adjustment built-in. They are fast... provide true samples of every batch processed.

All Sturtevant machines have "open-door" accessibility which permits quick, thorough cleaning... prevents the possibility of previous batches from contaminating new samples. Their rugged construction assures round the clock operation with practically no maintenance.

Investigate Sturtevant equipment for your laboratories. They will help you cut sampling costs... improve product quality... increase sales. Write for catalog, today.



LABORATORY SAMPLE GRINDER

Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

STURTEVANT MILL COMPANY

100 Clayton Street, Boston 22, Mass.

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

**"LIQUIDS WORTH STORING
ARE WORTH MEASURING"**

with a

LIQUIDOMETER

Tank Gauge

- FOR GAUGING LIQUIDS OF ALL KINDS
- 100% AUTOMATIC
- APPROVED BY UNDERWRITERS' LABORATORIES



THE **LIQUIDOMETER** CORP.

36-29 SKILLMAN AVE., LONG ISLAND CITY, N.Y.

SPRAYING SYSTEMS CO.

SPRAY NOZZLES



exact performance for every need

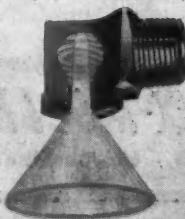
Choice of thousands of standard spray nozzles gives you exact spray pattern, capacity, impact and atomization. **PROMPT** . . . often immediate delivery from stock.



BE SURE TO WRITE FOR . . .

the most complete spray nozzle catalog ever printed . . . forty-eight pages of detailed information. Write for your free copy of Catalog No. 24.

SPRAYING SYSTEMS CO.
3275 Randolph Street • Bellwood, Illinois.



CHEMICALS

AREN'T

Kennedy makes packages for chemicals with the flick of a wrist—or the click of a machine. Either hand-made or machine-made bags, case liners and drum liners are turned out by the thousands . . . hourly . . . to package the products of the chemical industry.

CARBON BLACK

LIME

ARSENATES

CITRIC ACID

DYE STUFFS

SO

SOAP CHIPS

EXPLOSIVES

ROSIN

SULPHATES

Paper, plastic or foil . . . you name it, Kennedy has it . . . and can convert it into an engineered or conventional package for your chemical products.

TOUGH!

GLUE

FERTILIZERS

SUGAR

ABRASIVES

SULPHUR

ALKALIES

ACIDS

Our engineers are qualified through training and experience to deal with the special problems of chemical packaging. And our *mile-long line of men and machines* is your assurance of uniform quality at lowest possible cost.

Kennedy

CAR LINER AND BAG CO., INC.
SHELBYVILLE, INDIANA
(OFFICES IN PRINCIPAL CITIES)

Send me more information regarding Kennedy packaging for Chemical Industry.

WHICH *Figure Type*
IS YOUR FORMED PRODUCT?



Angular?



Hourglass?



Dior?



A new 12 page bulletin providing complete specifications, capacity requirements and industries served by Simpson Mix-Mullers is available on request.



with **SIMPSON MULLING** all shapes are fashionable

The formed products shown above are about as unlike in use and method of forming as are the Paris fashions from one generation to the next—but like ladies' apparel, they have one thing in common... they must be designed and produced to fit.

Whether they're extruded, pelletized, briquetted or cast, formed products must be thoroughly, *intimately* mixed to insure uniform dispersion of moisture and binder. Lack of proper dispersion means poor green strength or resistance to deformation and breakage... rejects, if discovered prior to firing and *trouble* in the form of porosity, poor finish and shrinkage, if discovered after firing.

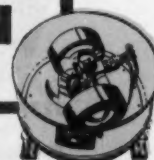
The photos have another thing in common—they're all selected from an *impressive* collection of tough jobs solved through controlled mulling in a Simpson Mix-Muller. If *you* mix... and it's dry but not a powder, wet... but not a fluid, it will pay you to find out why Simpson mulling is more economical, certainly more efficient than any ordinary mixing method you may now employ.

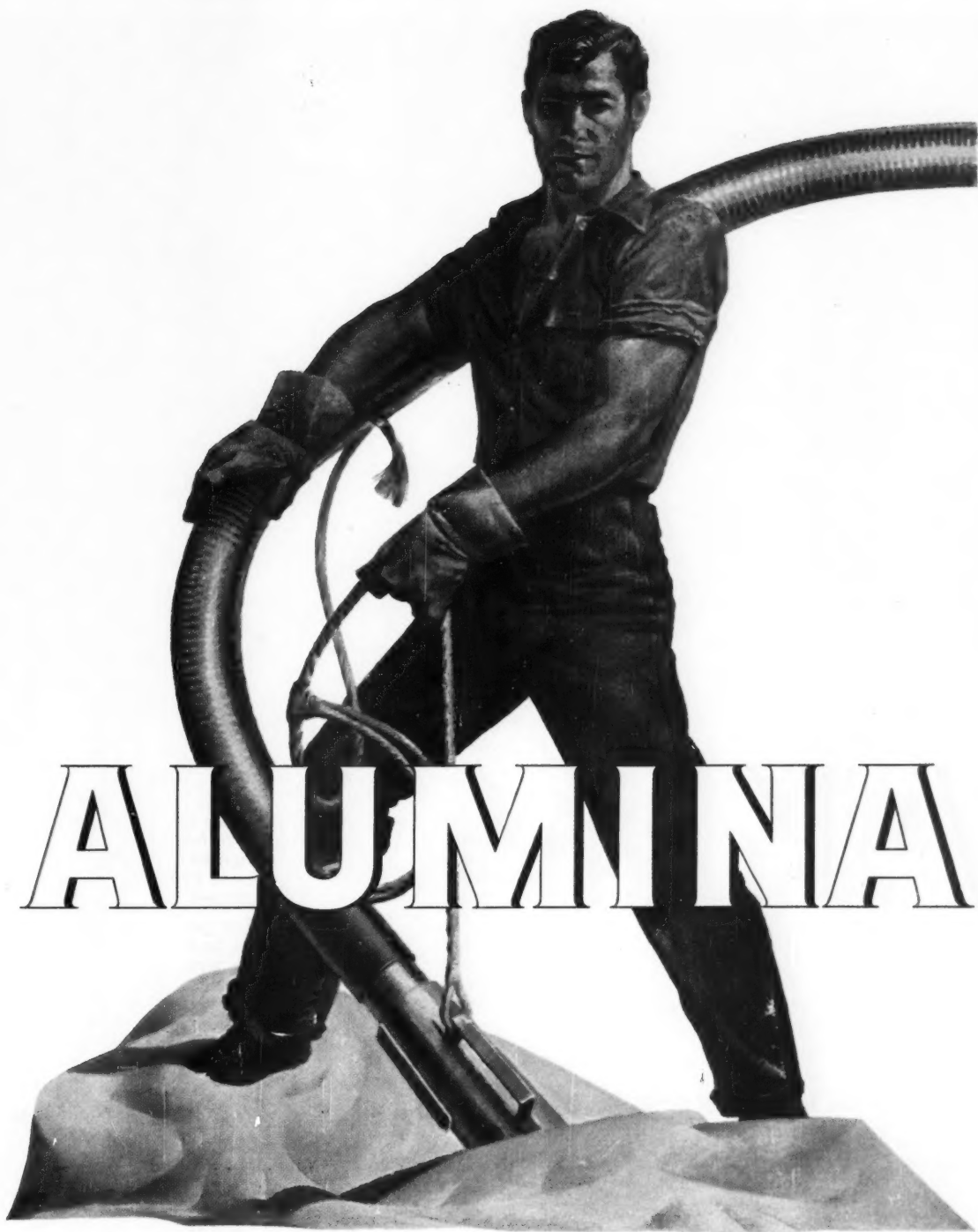
Available in 12 models in batch capacities of from 1/10 to 60 cu. ft., Simpson Mix-Mullers are serving every phase of the Chemical and Process Industry. Write for details and remember... mixing is our business, our principal business since 1914.



SIMPSON MIX-MULLER® DIVISION

NATIONAL ENGINEERING CO., 636 Machinery Hall Bldg., Chicago 6, Ill.
(Not Inc.)





When you specify **Kaiser Alumina** your order gets immediate, individual attention! You get prompt delivery—often overnight in emergencies. And you get experienced technical service.

That's why Kaiser Chemicals is a major supplier of calcined, hydrated, and active aluminas serving the

majority of the nation's users.

Call or write **Kaiser Chemicals Division**, Kaiser Aluminum & Chemical Sales, Inc. Regional sales offices: **OAKLAND** 12, California, 1924 Broadway . . . **AKRON** 8, Ohio, First National Tower Bldg. . . **CHICAGO**, 518 Calumet Bldg., 5231 Hohman Ave., Hammond, Indiana.

Kaiser Chemicals

calcined, hydrated and active aluminas

ALUMINA • BASIC REFRACTORY BRICKS AND RAMMING MATERIALS • DOLOMITE • MAGNESIA • MAGNESITE • PERICLASE



ALL TYPES...ANY CLASS FIRE!

Since different fire hazards require different types of fire extinguishers, PYRENE—C-O-TWO manufactures all types... the finest and most complete line on the market today.

When doing business with PYRENE—C-O-TWO, you receive unbiased advice on what is best for your particular fire hazards, whether class A, B or C.

Also, there is a well-rounded sales engineering organization having nation-wide representation to render top quality service wherever you're located.

Don't take unnecessary chances... the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts now!



PYRENE — C-O-TWO

NEWARK 1 • NEW JERSEY

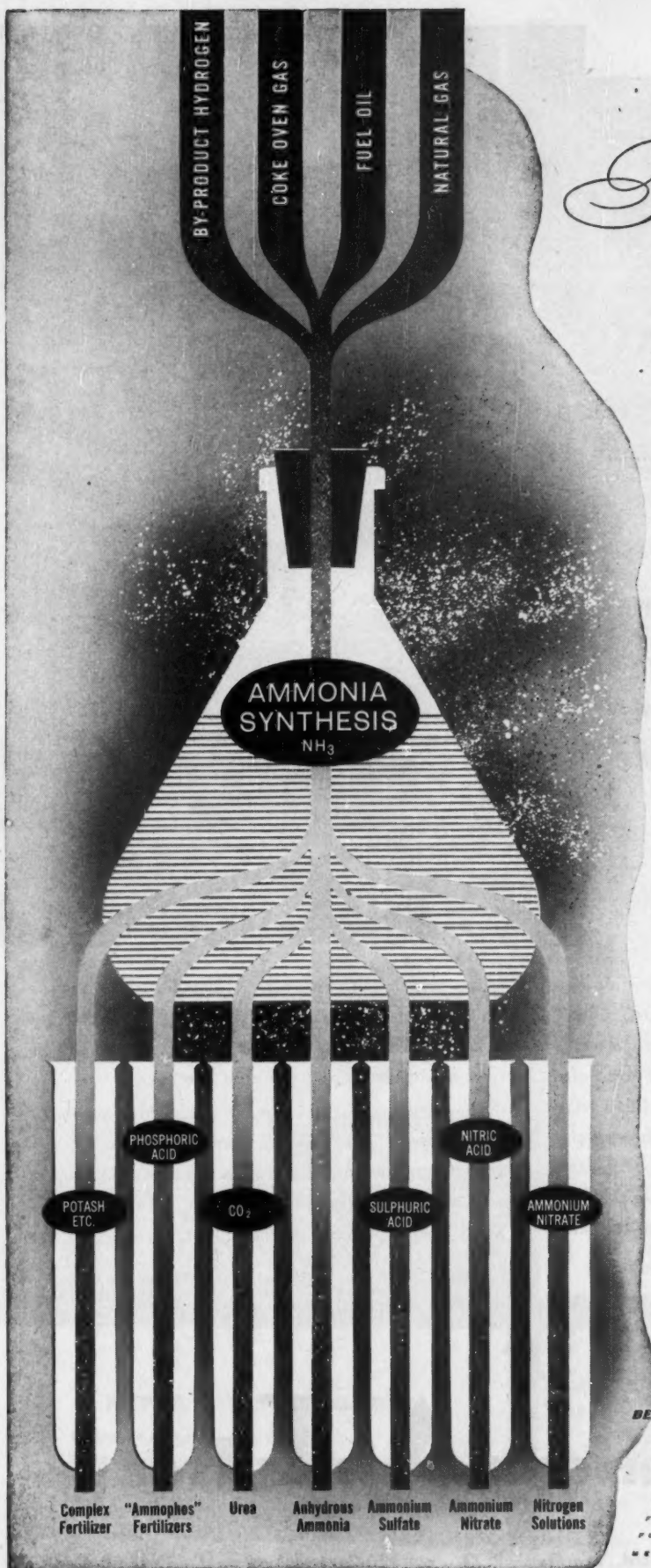
Sales and Service in the Principal Cities of United States and Canada



COMPLETE FIRE PROTECTION

portable fire extinguishers... built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM



Fluor

*combines process
experience with
two proven methods
to design and build
better ammonia plants*

Fluor is presently engaged in designing and building four ammonia plants representing a total investment of over \$40,000,000. Each plant will use a different raw material: electrolytic and other by-product hydrogen, fuel oil, natural gas, and coke over by-product gas. There is a wide range of source materials that may be used in ammonia plants designed and built by Fluor.

The Fluor ammonia synthesis process incorporates a pure synthesis gas feed with moderately high pressures to give very high yields of ammonia in a compact, easy-to-operate unit. The equipment features the world renowned Claude converter. By special arrangement, Fluor draws upon the valuable experience of L'Air Liquide of France which, for more than 30 years, has developed high pressure techniques to a high degree of perfection while building and operating its own ammonia plants, in addition to building plants for others throughout the world.

Fluor is licensed to employ the Texaco Partial-Oxidation Process, the most advanced means of manufacturing hydrogen from natural gas, fuel oils, and other hydrocarbon stocks. Fluor is also experienced in the processing of coke-oven gas for the preparation of hydrogen for available synthesis.

This broad ammonia experience plus Fluor's recognized ability to design and construct processing facilities is your key to a better ammonia plant.

BE SURE WITH

FLUOR



THE FLUOR CORPORATION, LTD.
LOS ANGELES 22, CALIFORNIA

FLUOR OF CANADA, TORONTO

FLUOR PERUANA, S.A., LIMA

HEAD WRIGHTSON, LONDON

ENGINEERS

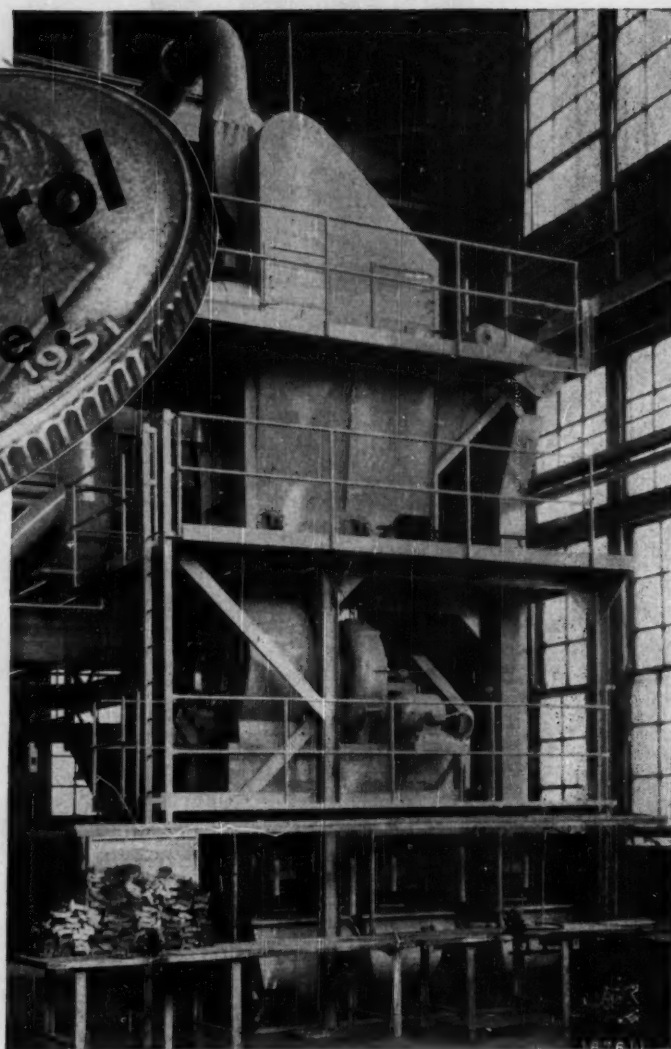
CONSTRUCTORS

MANUFACTURERS

NEW YORK
CHICAGO
PHILADELPHIA
BOSTON
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA



**Two complete ROTO-CLONE
dust control systems
occupy only
66 SQ. FT. of FLOOR SPACE**



LACK of room is no alibi for not providing efficient dust control. Here's a dual ROTO-CLONE® installation in a large foundry which occupies only 66 sq. ft. of floor space. A Type D of 4500 cfm capacity, located on lower platform, collects snag grinder dust. At top, a Type N of 6000 cfm capacity exhausts abrasive cleaning equipment. Dust and sludge from the two units are discharged through chutes into covered tote boxes at bottom for later disposal.

Every dust collector in AAF's complete line is a

space saver. And, with all this compactness, every unit is a high efficiency collector designed for constant exhaust volume and maintained performance over a wide range of operating conditions.

Remember—there is always room for modern dust control. The right equipment coupled with creative engineering thinking is certain to come up with a practical, economical solution. AAF has both. We'd like to prove it in your plant.

*ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.



American Air Filter
COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 326 Central Avenue, Louisville 8, Kentucky

WHAT'S THE PRICE OF THIS AGITATOR?



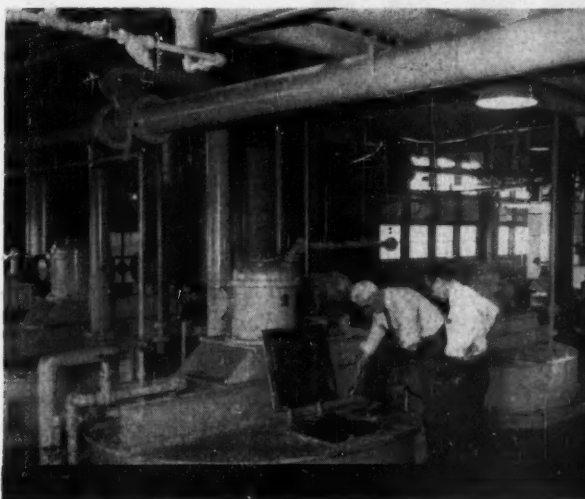
There are three "price tags" that add extra value to the purchase price of a Nettco Agitator. These are:

The engineering "price tag" — your assurance the Nettco drive is the right size, the right speed, the right horsepower, the right shaft diameter — backed by Nettco's over 50 years of serving the agitation needs of Industry.

The operating "price tag" — your assurance the Nettco unit is engineered for low power consumption and high productivity — two vital economy factors in any processing system.

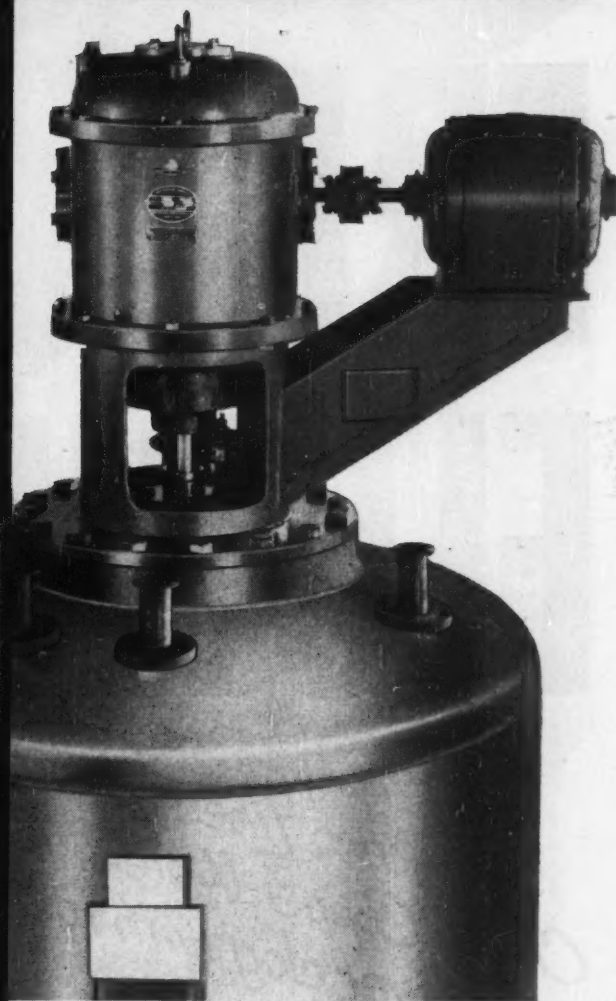
The maintenance "price tag" — your assurance the Nettco drive will minimize maintenance: with a minimum of moving parts — all conservatively rated.

Next time use Nettco — for engineered agitation that's lowest cost in the long run. Send for data and recommendations, to New England Tank & Tower Company, 87 Tileston St., Everett 49, Mass.



HELPFUL NETTCO CATALOGS

General Catalog No. 530
Side Drive Agitators, Bulletin No. 532
Nettco Flomix®, Bulletin No. 531



Installation of Nettco Agitators in new multi-million dollar dyestuffs plant — complete plant served by Nettco Engineered Agitation.



NETTCO
ENGINEERED AGITATION



FREE FLOWING!

*Process Lines of
Chase Copper Water Tube
can never clog with rust!*

Chase

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Because process line joints of Chase Copper Water Tube and Solder-Joint Fittings have *no* internal projections, your pumping costs are kept to a minimum. Even heavy industrial fluids flow freely through Chase Copper Water Tube — its clean, smooth interior surface can *never* clog with rust!

Process lines of Chase Copper Water Tube and Solder-Joint Fittings also put an end to costly repairs and maintenance. Once installed, the system stays pressure-tight, trouble-free.

Chase Copper Water Tube comes in long lengths, is easy to install, will give you years of rust-proof service. Find out more—Contact your nearest Chase Wholesaler or Chase warehouse.

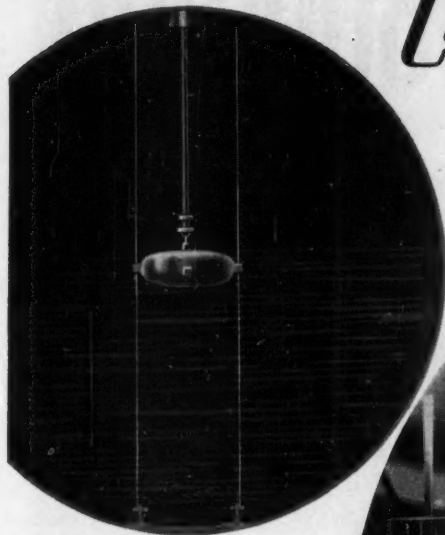
The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Detroit	Los Angeles	New York	St. Louis
Atlanta	Cincinnati	Grand Rapids†	Minneapolis	Philadelphia	San Francisco
Baltimore	Cleveland	Houston	Mississippi	Pittsburgh	Seattle
Boston	Dallas	Indianapolis	Newark	Providence	Waterbury
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(takes office only)

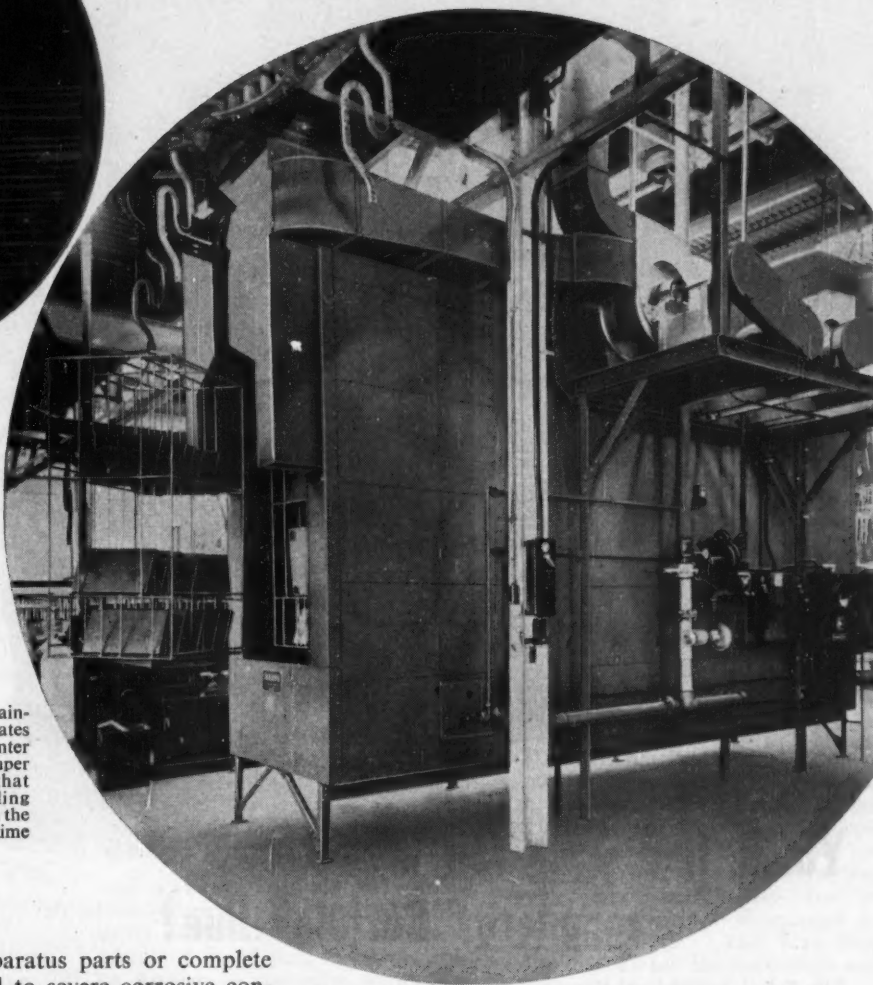
In Small Parts or Large...

Carpenter Stainless No. 20

Controls **STRONG** Corrodents



SMALL—This diagram shows float and attached steel indicator strip of an automatic gauge used in sulphuric acid storage tanks. These parts are made from Carpenter Stainless No. 20 and No. 20Cb for longer life.



LARGE—Carpenter Stainless No. 20Cb sheet, plates and tubing, and Carpenter No. 20 bars provide super corrosion resistance that keeps huge acid-pickling machines like this one on the job, saves maintenance time and expense.

Wherever you have small apparatus parts or complete large-scale equipment subjected to severe corrosive conditions, you can build extra service life into them with Carpenter Stainless No. 20 and No. 20Cb.

This super stainless alloy is highly resistant to H_2SO_4 concentrations or solutions, as well as a long list of other strong corrodents. So build with Carpenter Stainless No. 20 and No. 20Cb for greater freedom from corrosion troubles, extended equipment life, less down-time for replacements, and greatly reduced corrosion control costs.

This time-saving, cost-cutting super corrosion-resistant Carpenter stainless alloy is available in the form of No. 20Cb tubing, pipe, sheet and plate, as well as No. 20 bar, wire, strip, and billets. Ask your nearest Carpenter distributor or sales office for assistance on your corrosion problems... and a copy of the NEW Carpenter Stainless No. 20 and No. 20Cb handbook.

MEMBER



**The Carpenter Steel Company,
Alloy Tube Division, Union, N. J.**

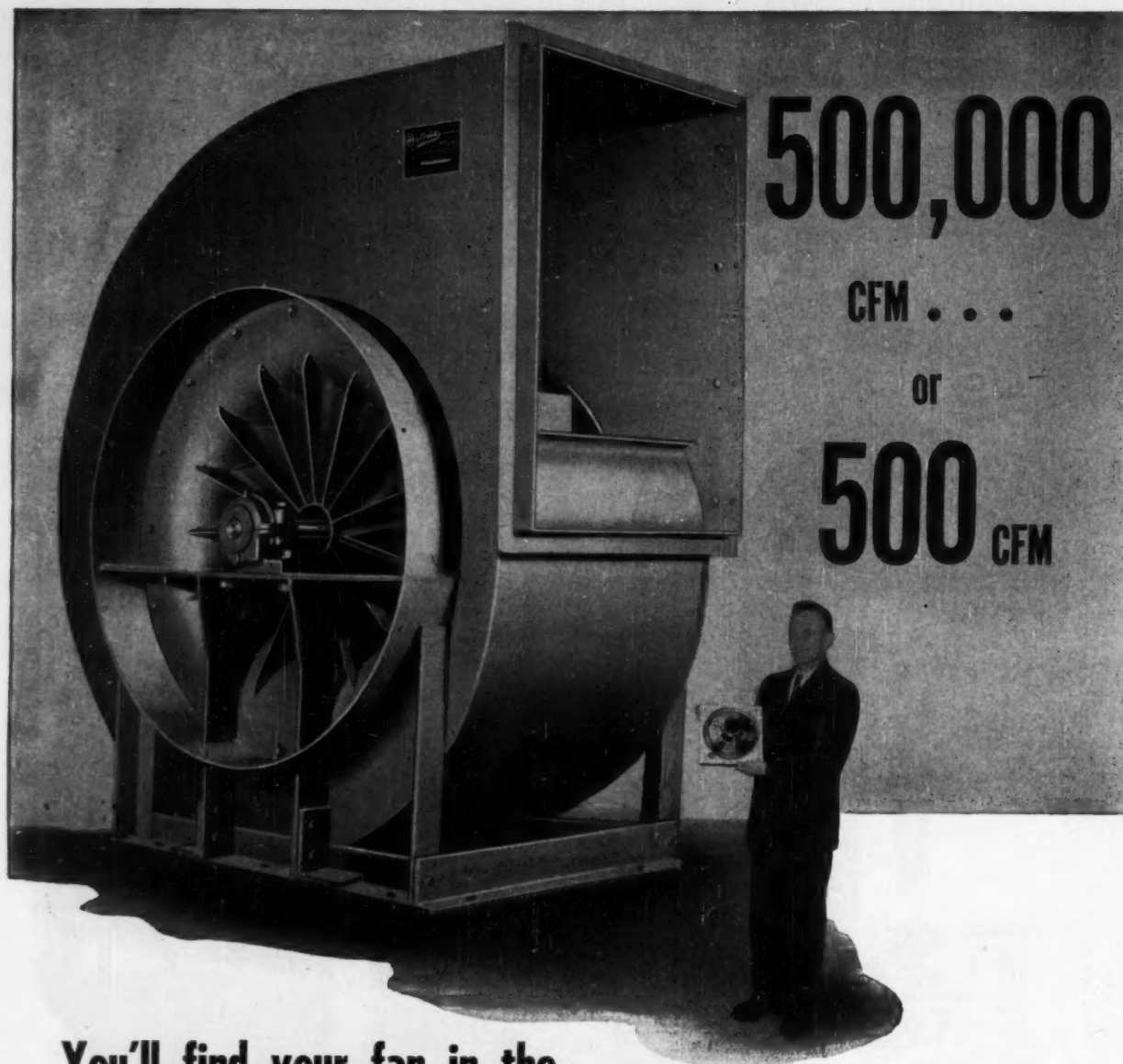
Export Dept., The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Carpenter



Stainless Tubing & Pipe

For information on Carpenter Stainless No. 20 strip, wire, billets, contact The Carpenter Steel Company, Reading, Pa.



You'll find your fan in the complete "Buffalo" line!

"Buffalo" builds *anything* and *everything* you need in the fan and blower line. Big ventilating fans in our standard sizes deliver up to one half million cubic feet per minute, and more if required for special applications.

The smallest "Buffalo" Breezo Propeller Fan delivers as little as 500 cubic feet per minute and fans of this type range in size up to 144" diameter. In between these two are Industrial Exhausters —

Pressure Blowers — Mechanical Draft Fans — Electric Blowers — Exhausters — Axial Flow Fans — Belted Vent Sets — Baby Vent Fans — HVA Heating and Ventilating Units — all built to the high standards of the famous "Q" Factor* which has given "Buffalo" users more for their money for 78 years.

Write us about your air needs. You need look no further than "Buffalo" for the best solution.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*



BUFFALO FORGE COMPANY

501 BROADWAY

BUFFALO, N. Y.

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives In All Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

HOW TO BUY CONVEYOR

and get...

MORE USE PER DOLLAR

where

**SPECIAL ENGINEERING
is needed**

Look for a make of belt backed by experienced, specialized engineering service.

Selecting the right conveyor belt to solve a special problem begins with selecting the right representative... one who will take interest in your particular belt needs and refer your problems to his factory if engineering help is required. Where a company makes a wide selection of conveyor belts for many applications, the representative can often recommend a feature construction to meet your job requirements. Where your problem is unique, that company backs its field men with custom engineering and comes up with a recommendation to meet your specific operating conditions.

Choose the company that offers complete belt engineering service... the source of supply that maintains close contact between factory and field.

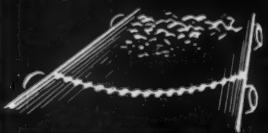
BELTS



GOOD TROUGHING



IMPACT RESILIENCE



HOLDS FASTENERS



RAYBESTOS-MANHATTAN CONVEYOR BELT ENGINEERING

A leading steel mill, faced with handling hot sintered ore without an insulating layer of "fines", had numerous belt failures due to charring.

An R/M representative called in a factory engineer. A new custom-engineered R/M conveyor belt with special cover now saves hundreds of dollars a year at the mill.

and... where hot ash and clinker was wearing out a conveyor belt every month at a Michigan cement plant, an R/M field man was able to furnish a specially engineered Homocord Belt which has outlived the best previous belt four times over.

and... special, "chevron cleated" conveyor belt was developed by

R/M, as a result of a field representative request, to replace a smooth surfaced belt unable to carry wet iron ore up a mine slope without costly spillage.

These are just a few of many instances where R/M engineering service has solved conveyor belt problems. In other cases, special job requirements have been met with R/M's exclusive constructions such as extra-flexible Ray-Man "F"... extra-cushioned Homocord for shock-loading... and Ray-Man Tension-Master for extra-high tensions and long lifts.

Let an R/M representative show you why R/M engineering makes R/M Conveyor Belts last much longer... give you "More Use per Dollar".

RM-502-A8



MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY
RAYBESTOS-MANHATTAN, INC.



Flat Belts



V-Belts



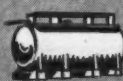
Conveyor Belts



Hose



Roll Covering



Tank Lining



Abrasive Wheels

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

COMBINES MACHINE RUGGEDNESS WITH INSTRUMENT PRECISION for dependable

low
maintenance
metering

REPUBLIC

pneumatic
transmitter
for measuring
FLOW, PRESSURE,
LEVEL or
DENSITY...



Machine dependability with instrument accuracy and sensitivity! Think what this combination of features can mean in your plant—less maintenance, longer life for lowest "long run" cost, continuous accurate operation.

You get all of these benefits and more with the Republic Pneumatic Transmitter. Force-balance operation permits the use of strong rugged parts with no sacrifice in accuracy or sensitivity. Gives exceptional overrange protection.

Housed in a durable metal case, the transmitter may be adjusted for mounting at any angle, indoors or out. Its accuracy is not affected by changes in ambient temperature vibration, nor-

mal changes in supply air pressure or inaccurate leveling. Uses no mercury or purge pots. Can be used with very viscous fluids.

The Republic transmitter isolates fluids to a measuring chamber which may be supplied in a variety of corrosion resistant materials. It sends an air pressure proportional to fluid flow, pressure, level or density to reading instruments or for actuation of an automatic controller.

Republic Pneumatic Transmitters are proving their superiority in hundreds of chemical and oil field applications. Investigate their advantages for you — write for your free copy of 36 page Data Book No. 1004.

SPECIFICATIONS:

ACCURACY — $\frac{1}{2}\%$ of maximum range guaranteed for standard models.

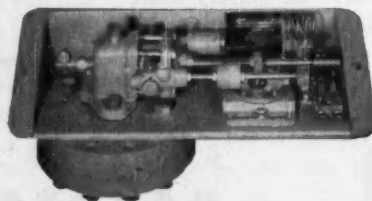
DIFFERENTIAL RANGES — Any desired span between 0-0.6" H₂O and 0-750 psi at operating pressures of 15 psig to 2000 psig.

PRESSURE RANGES — Any desired span between 0-1" H₂O and 0-2000 psig.

LEVEL RANGES — to meet almost any application.

DENSITY RANGES — 0.15 sp. gravity spread for 3 to 15 psig output pressure from any base density.

Extremely wide range change is possible without change of parts. Ranges may be easily changed, suppressed, compounded or reversed.



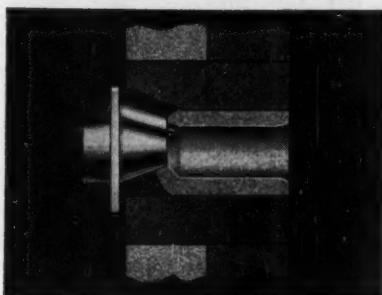
● **EASILY SERVICED** Cover can be completely removed for access to all range adjustments and replaceable parts. No special tools required.

REPUBLIC FLOW METERS CO.

2240 Diversey Parkway, Chicago 47, Illinois

WHY

'Surface' burners improve heating processes



Tunnel burners, single or twin-nozzled, assure you of complete and rapid combustion within the tunnel.

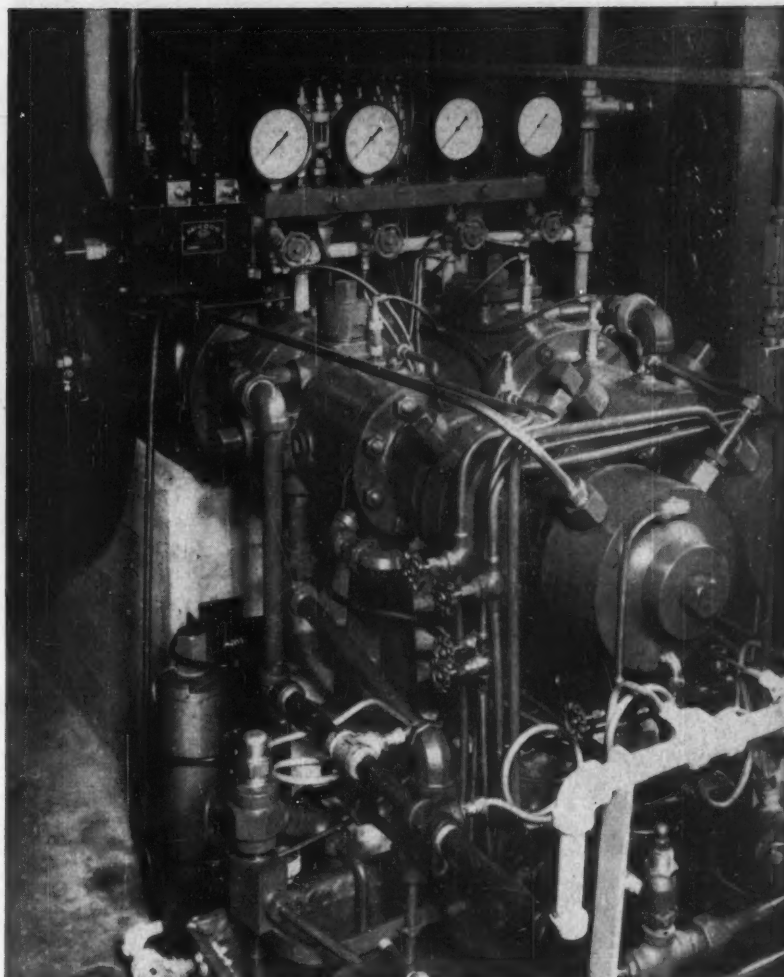
Thousands of 'Surface' burners, in the chemical industries, have speeded up and improved many heating processes because they:

- 1 Save fuel** with automatic proportioning.
- 2 Simplify control equipment** with one-valve operation.
- 3 Increase the range** of operating temperatures with high turndown ratio.
- 4 Increase safety** with a design which mixes gas and air at or near the burner—explosive mixtures piped very short distances.
- 5 Save time** in adjustment with easy-to-change spuds and inserts.

Select the right equipment from 80 types and 800 sizes completely described and rated in the 'Surface' catalog. Stop waste and start savings soon—call your 'Surface' engineer or write for Literature H54-16.



**SURFACE COMBUSTION
CORPORATION, TOLEDO 1, OHIO**



Six stage Norwalk compressor, used by a large university, compresses hydrogen to 25,000 pounds pressure

Horizontal duplex construction makes this compressor compact and sturdy. Frames with taper roller main bearings, reversible ring plate valves, force feed lubrication, generous intercooler coils are some of the features (common to all Norwalk compressors) that make for efficiency and long-term economy. Descriptive catalog forwarded promptly on request.



NORWALK COMPANY, INC.

SOUTH NORWALK, CONNECTICUT

makers of high pressure compressors for 91 years: 1864-1955

NOW...

to handle
those
difficult
piping
problems

JOHN CRANE

Offers a complete line of
BELLOWS MADE OF TEFLON*



- ① **Chemically inert**
—will handle all corrosive liquids, petroleum products, gases and solvents.
- ② **Life-long flexibility**
—will not damage or fatigue under severe vibration or repeated expansion and contraction.
- ③ **Outstanding electrochemical properties**
—eliminate electrolysis in the handling of chemicals, acids, etc.
- ④ **Wide temperature range**
—flex perfectly and otherwise physically unaffected over a wide temperature range.

Further information on Teflon parts and products, including bellows connectors, pump and valve packings, tubing and other molded forms, is available in "John Crane's" 12-page illustrated catalog, *The Best in Teflon*. Send now for your free copy. Crane Packing Company, 1809 Belle Plaine Avenue, Chicago 13, Illinois.

JOHN CRANE

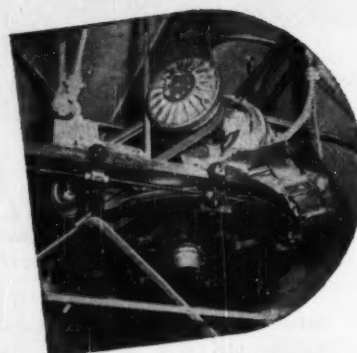
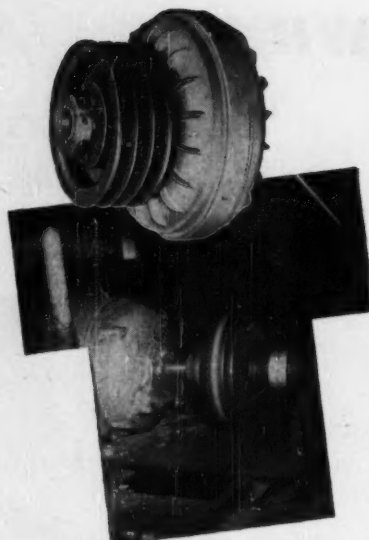
CRANE PACKING COMPANY

*DuPont Trademark for tetrafluoroethylene resin.

"John Crane" Bellows offer the Chemical Industry a positive answer in the transmission of "hard-to-handle" liquids and gases. Applications include vibration dampeners, expansion joints and connectors for misaligned couplings.

Made from a special densely molded stock and so machined that there is no inherent stress at their free length—they expand and contract in either direction with equal freedom of motion. End flanges of French-type gasket construction facilitate easy assembly and assure a leak-proof seal. Stock sizes are available in a full range of standard pipe dimensions from 1 to 8 in.

Bellows are also available in a wide range of designs suitable for metering pumps, pressure accumulators, batching scale connectors, etc.

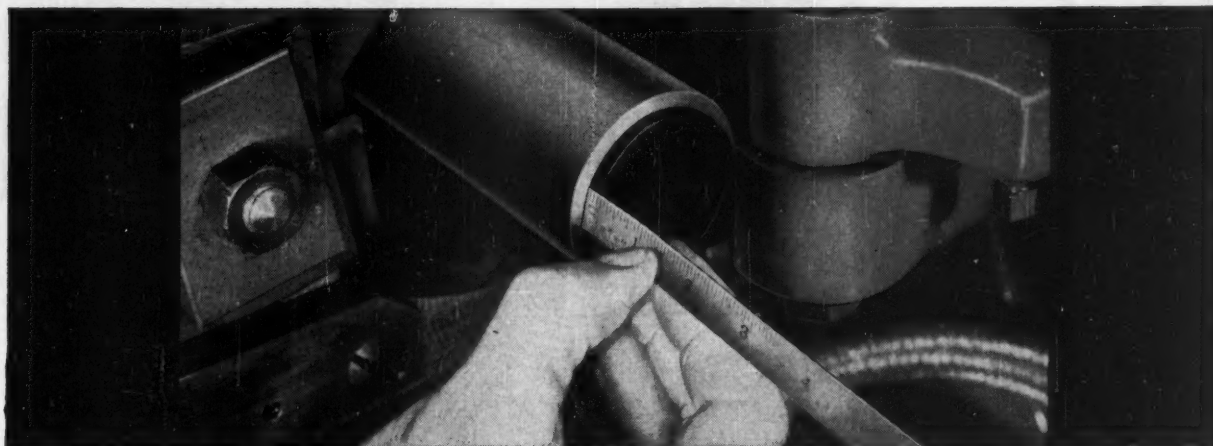


FLUID DRIVES for $\frac{3}{4}$ to 850 hp

You can solve motor burn-outs, jams and vibrations by eliminating mechanical connection . . . Twin Disc *Double-Circuit* Fluid Couplings provide smooth, automatic slip — yet transmit full output torque at all output speeds. Available in 9 different types, with a wide variety of input, output combinations for any motor or engine installations from $\frac{3}{4}$ to 850 hp. Write for Bulletin 144-D.



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois



You Can See Why SARAN LINED PIPE CUTS CORROSION COSTS

Corrosion resistant Saran Pipe swaged into steel is your answer to downtime losses.

Saran lined pipe, fittings and valves are built to convey acids, alkalies and other corrosive liquids at low over-all costs. The durable inner lining eliminates shutdowns due to corrosion and forms snug, tight-fitting joints that prevent leakage.

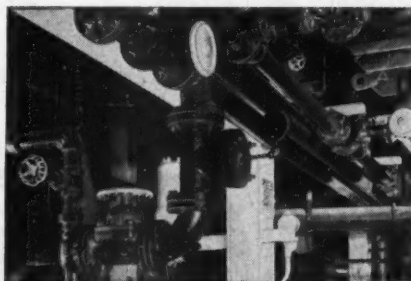
Saran lined pipes, fittings, and valves are easily and inexpensively installed. They are cut and threaded in the field with any standard pipe fitter's tools. Because of saran lined pipe's rigidity, even long spans require a minimum of support.

If your operation requires the conveying of corrosive liquids, and if downtime losses are troubling you, investigate saran lined pipe, fittings, and valves today. For further information, contact the Saran Lined Pipe Company, 2415 Burdette Avenue, Ferndale 20, Mich., Dept. 526A-1.

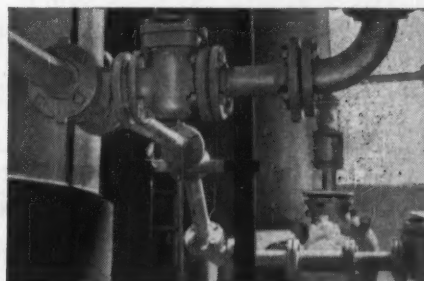
RELATED SARAN PRODUCTS—Saran rubber tank lining • Saran rubber molding stock • Saran tubing and fittings • Saran pipe and fittings.

**SOME OF THE MANY
INSTALLATIONS USING
SARAN LINED
STEEL PIPE**

*Saran Lined Pipe is Manufactured by
The Dow Chemical Company
Midland, Michigan*



A large chemical company uses this installation to convey demineralized water. It has a perfect record of keeping the water free of contamination for five years!



Saran lined pipe used for conveying hydrochloric acid at temperatures from 20° to 90°C., has had no unscheduled interruptions due to corrosion for over two years!

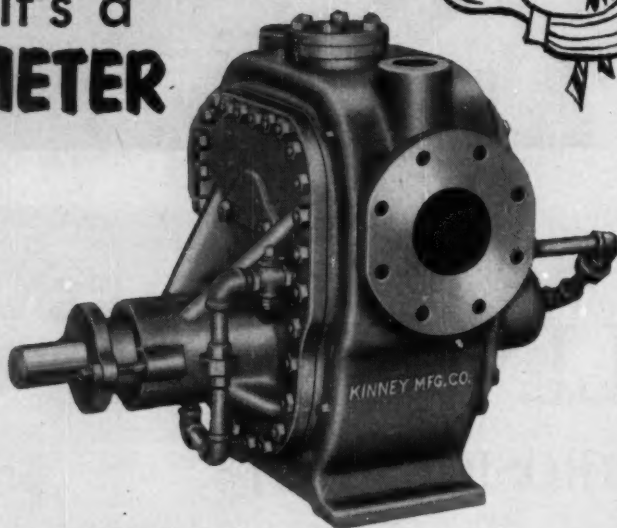
you can depend on **DOW PLASTICS**

DOW



It's a
METER

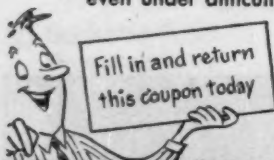
It's a
PUMP



It's **BOTH** PUMP and METER!

The Kinney Model SD Rotating Plunger Pump is often used for pumping viscous materials to and from storage and in process systems. Due to its unusually high volumetric efficiency, this famous pump is often used also for proportioning liquid components and metering fixed percentages of viscous liquids. The simple construction of the Kinney SD, without valves, blades, springs, or vanes, makes this pump virtually maintenance-free even under difficult operating conditions.

SD Pumps are available in capacities from 2 GPM to 3,000 GPM — steam-jacketed in most sizes.



KINNEY MFG. DIVISION
THE NEW YORK AIR BRAKE COMPANY

3551 WASHINGTON STREET • BOSTON 30 • MASS.

☐ Please send Bulletin L51 describing the complete line of Kinney Liquid Pumps.

Name.....

Company.....

Street.....

City..... State.....



SCREENING NEWS

Another production
problem solved
by **SWECO** Vibrating
Screen Separator



Wax kept in, solids screened out of shellac

Clearing a shellac solution of 5% undissolved solids, such as dirt, bark and insect bodies, without also removing the wax, presented a problem to an Oregon chemicals firm. An 18" dia. SWECO vibrating screen separator handled the assignment, screening the solution (crude shellac in a 1% soda ash solution.) Company now obtains the desired clearance of foreign matter, using 100-mesh screen cloth. Solution weighed approximately 65-70 lbs. per cu. ft., with specific gravity of 1.04 to 1.12.

Separation of solids from brine-potash solution

"Very gratifying" was the verdict of a Texas chemicals firm after using a SWECO vibrating screen separator to remove solids from a highly corrosive brine-potash solution. Need was particularly urgent because the solution was so corrosive that the company was incurring heavy expenses in scraping, painting and replacing steel plates in the classifiers. Initial demonstration, using 20-mesh cloth, was very satisfactory. Company now has two 48" diameter sweco vibrating screens, uses a range of cloths: 16, 20, 30, and 35 mesh.

Free screening analysis and recommendations . . . SWECO District Engineers are available to make detailed analyses and recommendations on specialized screening operations without cost to you.

Detailed data file
on request

Engineers
and constructors
... Manufacturers



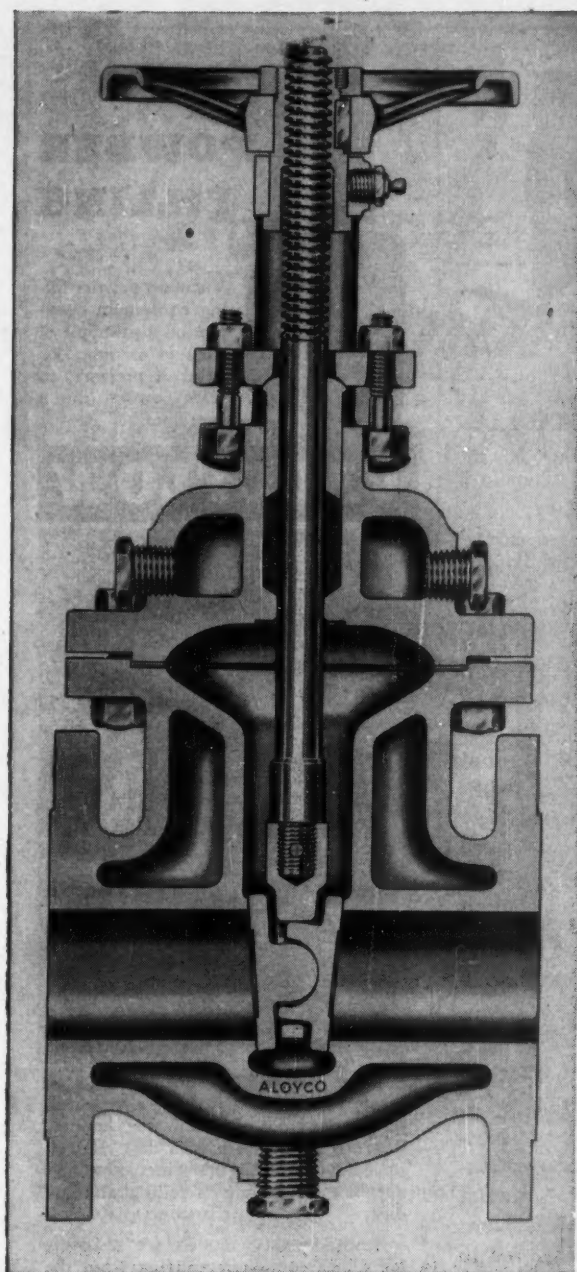
Southwestern Engineering Company
4800 Santa Fe, Los Angeles
LOgan 8-6262 • Cable—SWECOLA

Please send data file #39-32

Name.....

Firm.....

Address.....



Cross-section shows how jackets extend to edge of flanges and include stuffing boxes on this Aloyco 1105 Jacketed Gate Valve. Also shown are the non-fouling, ball-and-socket split-wedge disc and mar-proof rocker-type gland plate and follower.



Now- fully jacketed valves put the heat on slow-moving corrosives

Does your plant handle corrosive fluids that slow down or solidify under normal temperatures?

Then you're in line to benefit from the heat-holding design of Aloyco jacketed Gate, Globe and Check valves. Besides having all the Aloyco features shown at left, they're the only high alloy valves on the market to be *completely jacketed*.

They keep valves at higher temperature than steam tracing systems, and provide more uniform, less hazardous heating than thermal electric methods. You'll find them especially useful in line processing of rosin, resins, tars or tar oils, phthalic or maleic anhydrides, molten sulphur and other viscous liquids.

We'll be glad to arrange for a trial installation of Aloyco jacketed valves in your plant. Write the Aloyco Corrosion Engineering Service for further information. Alloy Steel Products Company, Inc., 1323 West Elizabeth Ave., Linden, N.J.

4.14

Fact-filled Bulletin No. 3 lists specifications and uses of Aloyco Jacketed Valves. Send coupon for your copy today.



ALLOY STEEL PRODUCTS COMPANY, INC.
1312 West Elizabeth Avenue
Linden, New Jersey

Gentlemen:

I am interested in Aloyco jacketed valves. Please send me a free copy of your Bulletin No. 3.

Name

Firm

Address

City Zone State

plant-location news



Market data can make the difference ...

Only the most detailed, up-to-the-minute information can show if a new plant site is near your *best* potential markets . . . whether these market areas will change in size or character . . . or if new and bigger markets for your products can be developed in a particular locality.

But how can you be sure that your market data is current and complete? That it will answer most plant-location problems? If you're planning to establish a new plant in relation to your market, here's one way you can get all the facts needed to make the right decision on location. Just contact the Industrial Location Service of New York State.

Facts are our forte ...

ILS market data covers a lot of ground. One of the big reasons for this is that we're associated with the state government. This gives us access to facts and figures on incomes, consumption, and population shifts that individual researchers might find hard to get. And detailed market data like that can make a big difference in choosing the right plant site!

Detail is our dish, too ...

Another thing that makes our service unique is the *extent* of our records. Over the years we've been able to chart trends in expenditures, retail inventories, and family composition, among

other things—for every area in the state. A lot of companies have found these figures mighty helpful in spotting just the markets they want to hit.

Doesn't matter whether yours is an industrial or consumer product, either. In most instances figures can be provided representing present industrial consumption of specific products within a given radius of suggested New York State locations. Or on the size and number of companies to which you'll be selling. All this information is free and strictly confidential.

Other free plant-site services

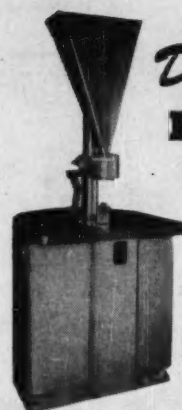
Markets won't be your only concern when you're looking for a new plant location. But no matter what factors are involved, ILS can be of help.

Reports are available on transportation, buildings and sites, raw materials, labor, water and local laws and regulations—to mention just a few. All of these surveys are tailored to meet your requirements, and are sent to you without any cost or obligation in full confidence.

Our booklet called "Industrial Location Services" shows how you can put this valuable plant-location data to work. To get your free copy, just drop me a card, care of the New York State Department of Commerce, Room 855, 112 State Street, Albany 7, New York.

Ronald B. Peterson

Director, Industrial Location Service



Dustless POWDER FILLING

Vacuflow powder filling equipment operates on a principle of vacuum feeding, instead of pressure, to pack powder into a container.

VACUFLOW



Air is removed from the container to create a vacuum which draws a measured quantity of powder from the hopper. There is no problem with dust control, since the unique Vacuflow method simply does not involve air currents that cause dust.

Semi-automatic models are available for filling containers ranging from the tiny talcum box up to and including 100 lb. paper bags and 200 lb. drums. Rotary models are available for automatic production of 5 lb. sizes or less at speeds of 45 to 300 per minute.

Pneumatic is the one manufacturer in a position to furnish machines for making up complete production lines. Units are available for air cleaning, powder and liquid filling, capping and labeling a wide range of bottles, cans or jars.

PNEUMATIC SCALE CORP., LTD.
85 Newport Ave., Quincy 71, Mass.
Also: New York; Chicago; San Francisco;
Los Angeles; Seattle; Leeds, England

Canadian Division:
Delaware & Williams Company, Ltd., Toronto



7 Typical Emulsions and Dispersions *Improved by* Gaulin Homogenizers

LATEX THREAD — makes it smoother, more uniform . . . improves dip and extrusion characteristics.

LIQUID STARCH — Stops separation. Improves transparency and clarity.

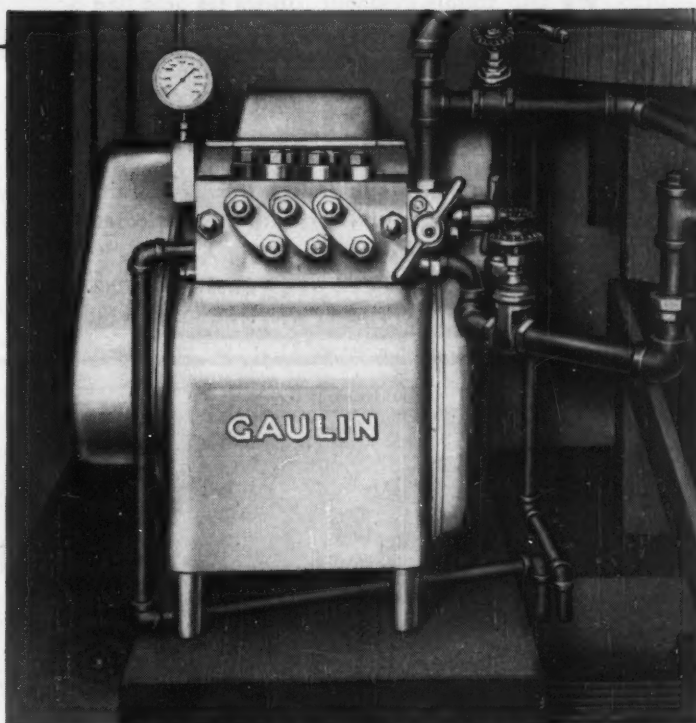
PIGMENT DISPERSION — gives a finer, more uniform suspension with less temperature rise.

LUBRICATING OIL — improves lubricating value and stability. Increases service life.

CREAM OIL — Looks less greasy, feels less greasy . . . spreads quicker, holds better.

COSMETIC EMULSION — Has a smoother texture, longer shelf-life. Perfume is locked-in against evaporation.

WAXES — for uniform, stable emulsions and viscosity control.

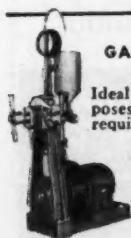


Warwick Division of Sun Chemical Co. uses this 500 GPH Gaulin to process its water repellent mixtures into uniform, stable emulsions.

And there are many more, each with its own set of reasons for using Gaulin Homogenizers. But there's one they *all* agree on — Gaulin Homogenizers are a **FASTER, MORE ECONOMICAL**

way to make uniform and stable emulsions or dispersions.

Why not investigate today. Complete testing facilities and engineering advice are yours without obligation.



GAULIN PILOT PLANT HOMOGENIZER

Ideal for experimental purposes, operation or process requiring up to 25 gallons per hour capacity. Handles quantities as small as one pint. Available on low rental basis.



GAULIN TWO-STAGE COLLOID MILL

Stator is jacketed for cooling or heating. Gap setting adjustable for .001" to .045". Only 45 seconds clean-up required in changing colors. 12" head room. 12" x 17" floor area.



Manton-Gaulin MANUFACTURING COMPANY, INC.

71 GARDEN STREET, EVERETT 49, MASS.

World's largest manufacturer of Homogenizers,
Triplex Stainless-Steel High Pressure Pumps,
and Colloid Mills

STANLEY

IF YOU WILL LET US KNOW: The Product You Are Filtering—Type of Equipment You Operate—Plate and Frame Or Rotary Filter—Whether Acid or Alkaline Solution—Temperatures—Pressure—WE WILL MAKE SOME SUGGESTIONS.

FILTER CLOTH

Over 40 different cotton weaves, including filter twills, chaincloths, and filter flannels,

MAY SOLVE

We also handle synthetic fabrics for acid and alkaline solutions—Nylon, Orlon, Dynel, Polyethylene, Dacron, Saran. Woven glass cloth for highest temperatures.

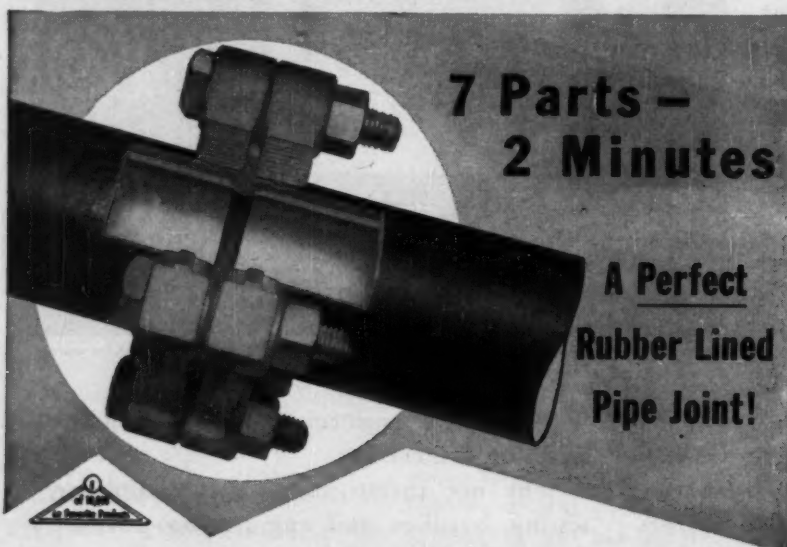
YOUR PROBLEM

These cotton and synthetic fabrics are furnished by the yard or by the roll or cut and fabricated to meet your requirements.

WRITE FOR
SAMPLES

WM. W. STANLEY CO. Inc.
401 Broadway, New York 13, N. Y.

DUST COLLECTOR
BAGS AND
TUBES



7 Parts —
2 Minutes

A Perfect
Rubber Lined
Pipe Joint!

In the field or in the shop, FIELDLINK® pipe joint for RUBBER LINED pipe radically reduces the cost of rubber lined pipe installations. Repairs to pipe lines quickly made by using FIELDLINK in place of standard pipe flanges on lined piping.

Easily installed by field or shop men—without piping layouts or engineering assistance.

For Complete Details, Send for Bulletin 2958

TRADE MARK

LA FAVORITE RUBBER MFG. CO.

269 Wagaraw Road • Hawthorne, N. J.

RUBBER LININGS • RUBBER COVERING • RUBBER ENGINEERING

CHEMPRO TEFLON STOCK of HIGHEST QUALITY VIRGIN POLYMER

You get better, longer lasting parts from Chempro's Teflon® stock, as it is made from only the finest virgin polymer. Cylinders and tape are made from grade TF-5 polymer. This pure, high quality material assures you a denser, more uniform Teflon for greater service life.

For special applications, Chempro Teflon stock is also available glass-filled (FM-2), glass- and carbon-filled (FM-4) or zirconium-filled (FM-8). Our engineering and laboratory facilities are available to help adapt these materials to your needs.

Write for further information.



MOLDED CYLINDERS

2" O.D. and up with minimum wall thickness of $\frac{1}{8}$ " in increments of $\frac{1}{16}$ ". Maximum length is 12".



TAPE

.0025" to .010" thick x $\frac{1}{8}$ " to 12" wide; .015" to .060" thick x $\frac{1}{8}$ " to 12" wide.



TEFLON SHEETS

Standard stock sizes: 24" x 24" and 48" x 48" in $\frac{1}{8}$ " and $\frac{1}{4}$ ". Lengths up to 60" in standard thicknesses from $\frac{1}{8}$ " to $\frac{1}{4}$ ". Special sheets available in thicknesses up to 2".



EXTRUDED TUBING

$\frac{1}{4}$ " I.D. x $\frac{3}{8}$ " O.D. to 1" I.D. x $2\frac{1}{8}$ " O.D., continuous.



RODS

EXTRUDED— $\frac{1}{4}$ " to 2" O.D. in increments of $\frac{1}{16}$ ", in lengths up to 12'. MOLDED— $\frac{1}{8}$ " to 2" O.D. x 12" long, in increments of $\frac{1}{16}$ "; 2" O.D. and over in increments of $\frac{1}{4}$ " x 6" to 12" long.

*duPont trademark

THE ORIGINAL FABRICATORS OF
TEFLON PACKINGS AND GASKETS



CHEMICAL & POWER
PRODUCTS, Inc.

5 Broadway, New York 4, N. Y.

Let **Dings**
help you select the
**MAGNETIC
SEPARATOR**
that will best meet
your specific
requirement

● Why not eliminate guess-work from magnet selection? To assure a successful installation, it is simply a matter of choosing exactly the right magnet for the job.

At Dings, "job-selecting" a magnet can be done on an ideal basis because Dings, and only Dings, offers these three things: (1) the widest line of types and sizes available; (2) unsurpassed quality of materials and magnetic engineering; (3) OVER 50 YEARS' EXPERIENCE IN THE DESIGN, MANUFACTURE AND APPLICATION OF EVERY CONCEIVABLE TYPE OF MAGNETIC SEPARATOR. Whatever your magnetic separation problem, these are the advantages you get when you buy a Dings "Job-Selected" magnet.

Shown on this page are but a few of the wide range of Dings Magnetic Separator types now available. Clip and mail the coupon for further information.

DINGS MAGNETIC SEPARATOR CO.
4730 W. Electric Ave.
Milwaukee 46, Wis.

Please send copy of Catalog C-5000-B.

Name _____ Title _____

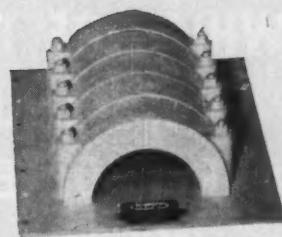
Company _____

Address _____

City _____ Zone _____ State _____

AD155

**PERMA-
PLATES**



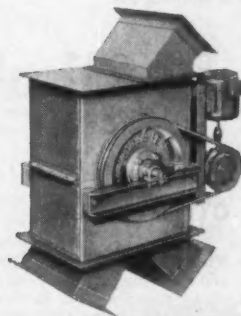
Use these non-electric magnets for installation in steel or wood chutes or spouts or above belts. Use Type 1 when depth of material does not exceed 1"; Type 2 for burden depths to 2"; Type 3 for burden depths to 3". Available with two poles for standard service and four poles for maximum protection on difficult jobs. All sizes. *Here is the lowest cost answer to your tramp iron removal problems!*

**PERMA-
PULLEYS**



Install as a non-electric head drive pulley in belt conveyor systems. Completely automatic removal and discharge of iron. Extremely powerful. Meets all requirements. Complete range of sizes.

**PERMA-
DRUMS**



Install bare drums at the discharge of spouts or chutes; fully enclosed models can be installed in closed chutes for completely dust tight installations. Highest grade Alnico. More powerful than old electro-drums. Fully automatic removal and discharge of iron. Complete range of sizes.

Dings

DINGS MAGNETIC SEPARATOR CO.
4730 W. Electric Ave. • Milwaukee 46, Wis.

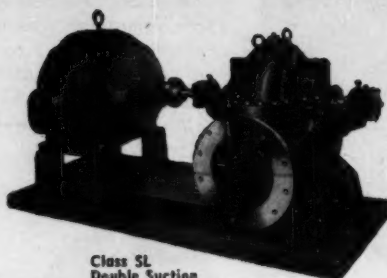
*Magnetic Separation
Headquarters Since 1899*

WHICH OF THESE "BUFFALO" PUMPS COULD BE SOLVING YOUR PROBLEMS RIGHT NOW?

(Efficiently — Economically)

CLEAR WATER

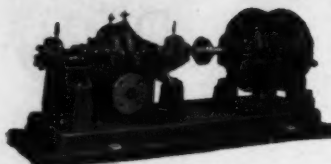
"Buffalo Double Suction Pumps are the finest example of the "Q" Factor* that gives you the most for your pumping dollar. Hydraulically balanced, highly efficient and durable. In sizes to deliver from 10 to 14,000 gpm for circulating, air conditioning, other plant services. Request Bulletin 955-Q.



Class SL
Double Suction

BOILER FEED

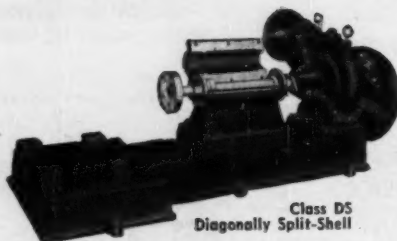
For boiler feed and other clear water service against high pressures, write for Bulletin 980 and see how efficiently these, rugged "Buffalo" Type "RR" Pumps perform. In 2 and 4 stages to handle up to 500 psi. Capacities up to 900 gpm.



Class RR
Multistage Single Suction

PAPER STOCKS

For handling high consistency liquids, you'll save money and trouble with non-clogging "Buffalo" Paper Stock Pumps. Available in alloys or rubber-lined for corrosive and abrasive liquids. A pump for every job described in Bulletin 953.



Class DS
Diagonally Split-Shell

CHEMICALS

A complete line of "Buffalo" Pumps, ready to handle corrosive or abrasive liquids at least maintenance cost. Write for Bulletins 976 and 982.



Class CS
Single Suction

OTHER PUMPS

"Buffalo" builds Vertical Ejectors, Sewage Pumps, Fire Pumps, Marine Pumps and the husky, space-saving Close-Coupled Pump shown. In short, there's a "Buffalo" Pump for best results in any application you may have in mind. Write us about your problem!



Class CCL
Close-Coupled.
Write for Bulletin 957-D.



*The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.

BUFFALO PUMPS, INC.

501 BROADWAY

BUFFALO, N. Y.

Subsidiary of Buffalo Forge Company
Canada Pumps, Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

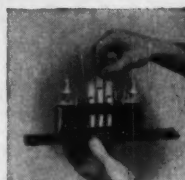
TAYLOR COMPARATORS



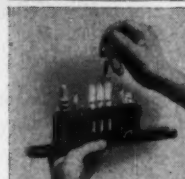
"never
knew
pH,
CHLORINE,
PHOSPHATE

TESTS could be
so easy!"

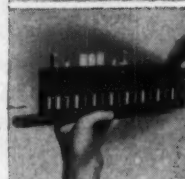
Just fill 3 test tubes
with the sample to
be tested and place
them in the base...



add reagent to
middle tube only...



place color stand-
ard slide on base.
Move the slide
across until the
colors match and...



*There's the
Value!*

You can make pH, chlorine, phosphate or nitrate determinations with these 3 easy steps with Taylor Comparators. Complete water analysis, including fluorides, is only a little more detailed when you use a Taylor Water Analyzer. Taylor sets are lightweight, durable, portable. Many different tests can be made on a single base. Best of all...

COLOR STANDARDS ARE GUARANTEED

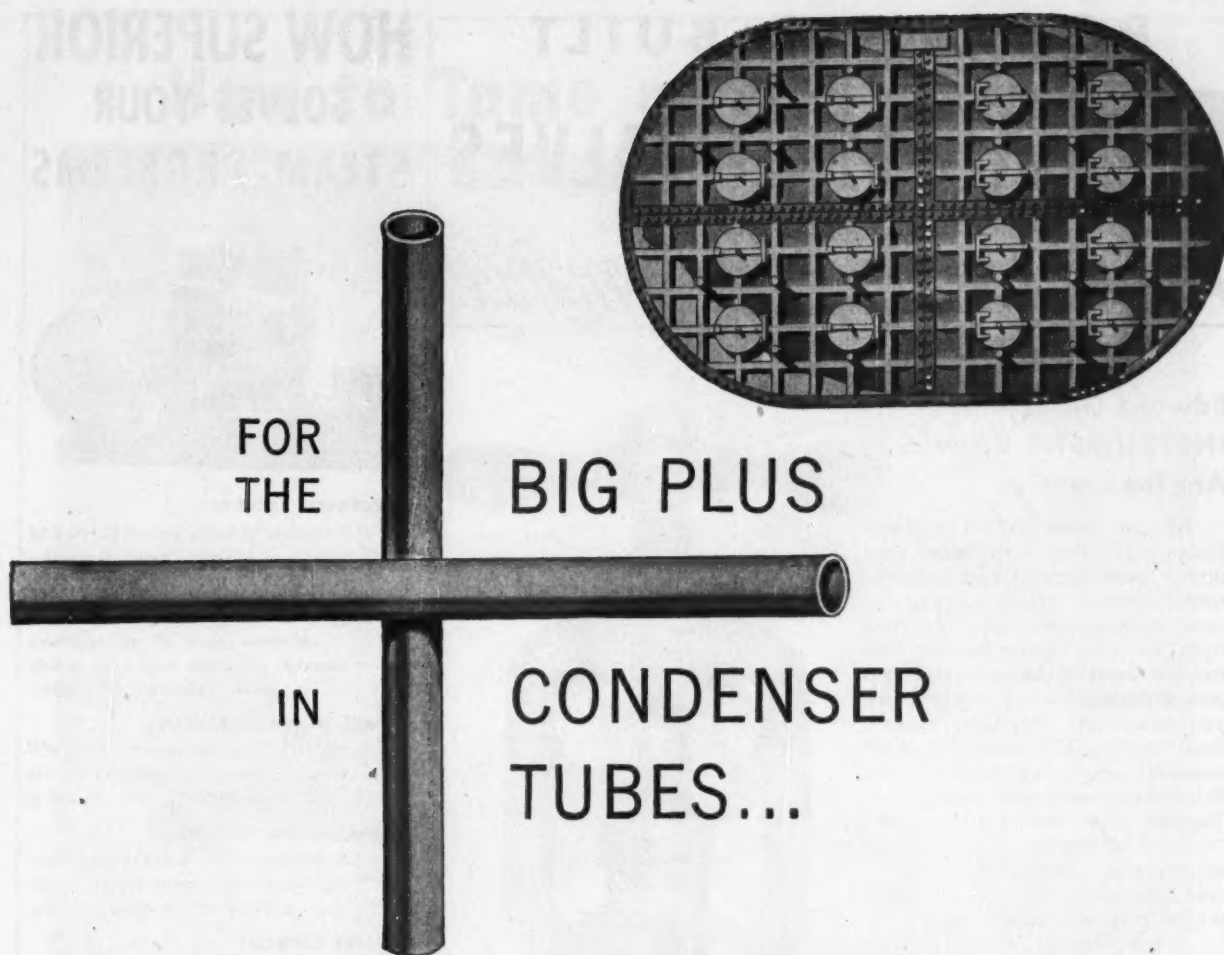
Taylor liquid color standards carry an unlimited guarantee against fading, thus there's no chance of mechanical inaccuracy. Since a complete set of standards for any one determination is enclosed in a sturdy plastic slide, there's no need to handle fragile single standards.

SEE YOUR DEALER for Taylor sets or write direct for FREE HANDBOOK, "Modern pH & Chlorine Control." Gives theory and application of pH control, illustrates and describes full Taylor line.



W. A. TAYLOR AND CO.

414 RODGERS FORGE RD. • BALTIMORE, MD.



Use Bridgeport Arsenical Admiralty

Admiralty, *plus arsenic*, in this Bridgeport Condenser Tube Alloy gives good corrosion resistance to most types of circulating waters—in seaboard power stations as well as inland installations.

Bridgeport Arsenical Admiralty is highly resistant to biofouling since it is unaffected by mild chlorination. The arsenic acts as an inhibitor to dezincification.

This alloy is only one of Bridgeport's many Condenser Tube Alloys made to A.S.T.M. Standards to meet various types of corrosion problems. Bridge-

port's Technical Service and Corrosion Laboratories are available to help you select the alloy best suited to your operating conditions. Call your local Bridgeport Sales Office to use this service to your advantage.

Write for your copy of Bridgeport's Condenser and Heat Exchanger Handbook...156 pages of valuable data on condenser tube alloys, applications and corrosion problems.



BRIDGEPORT BRASS
COMPANY ♦ BRIDGEPORT, CONNECTICUT

Sales Offices in Principal Cities—Conveniently Located Warehouses
 Mills at Bridgeport, Conn., Indianapolis, Ind., and Adrian, Mich.
 In Canada: Noranda Copper and Brass Limited, Montreal



ROCKWELL-BUILT Edward VALVES

FOR LOW COST—High Performance

Edward GAGE and INSTRUMENT VALVES Are Inexpensive

In small piping Edward Gage and Instrument valves with forged steel bodies insure strength and compactness. Fine stem threads permit accurate regulation and keep the stem from "traveling" under pressure. Perfect alignment of the stems and seats plus centerless grinding of stems give you permanent drop-tight closure. Positive finger tight testing at rated pressures proves tightness of each Edward Gage and Instrument valve. Tapered pipe thread bonnet and "bonnetless" designs insure leakproof construction. These rugged valves cost little; reduce maintenance; give longer, more dependable service.

Always specify Edward. Only Edward Valves Equal Edward Quality and Performance.



Fig. 152 J



Fig. 153

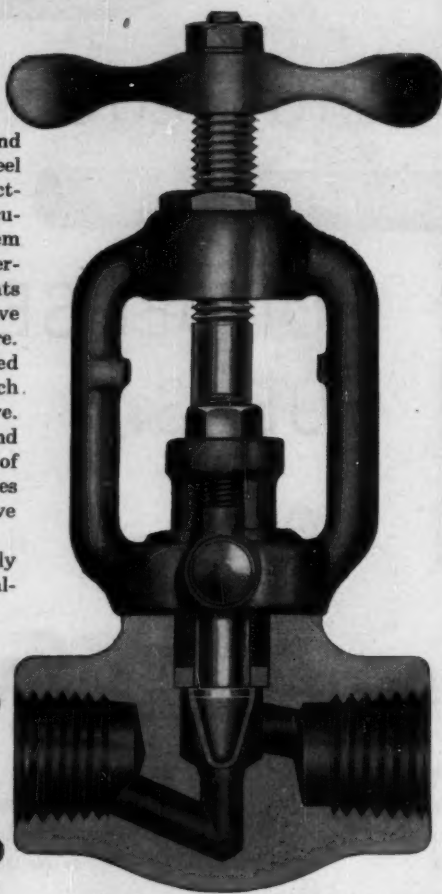


Fig. 952

EDWARD FORGED GAGE AND INSTRUMENT VALVES

GAGE RATINGS to 4000 lb WOG—Sizes $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1"

Fig. 152*—Globe—carbon steel—inside screw—screwed or welding ends.

Fig. 153*—Angle—carbon steel—inside screw—screwed or welding ends.

*Fig. 152J and 153J have male inlet and female outlet

INSTRUMENT RATINGS to 6000 lb WOG—Sizes $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1"

Fig. 952—Globe—carbon steel—OS&Y—bonnetless design—screwed or welding ends.

Fig. 2953—Angle—stainless steel—OS&Y—bonnetless design—screwed or welding ends.

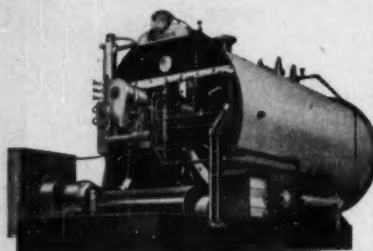
NOTE: Forged bodies in 18-8 stainless and 13% Chromium steel also available.

For more complete details on instrument and gage valves as well as the complete line of Rockwell-Built Edward cast and forged steel valves ask for the Edward Condensed Catalog.

Edward Valves, Inc.
Subsidiary of ROCKWELL MANUFACTURING COMPANY
1224 West 145th Street, East Chicago, Indiana



HOW SUPERIOR SOLVES YOUR STEAM PROBLEMS



A COMPLETE PACKAGE

Completely factory-assembled and tested, a Superior Steam Generator is backed by undivided responsibility.

INDUCED DRAFT THAT'S BUILT-IN

... eliminates need of an expensive chimney... Multiple fans draw evenly on all tubes, reducing maintenance.

4-PASS, DOWN-DRAFT DESIGN

High gas velocities produce high efficiency. Down-draft design promotes rapid evaporation, quicker steaming.

AMPLE HEATING SURFACE

A minimum of 5 sq. ft. of heating surface per boiler horsepower assures maximum efficiency at full rated capacity.

RESERVE CAPACITY

Greater steam space and large evaporating surface provide ample reserve capacity & better than 99% dry steam.

NO EXPENSIVE FOUNDATION

Built on a rigid channel iron base, a Superior Steam Generator needs only a floor capable of supporting its weight.

BUILT-IN CONTROLS

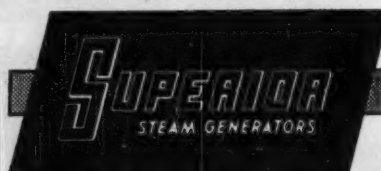
All controls essential to completely automatic operation are factory-wired into an easily accessible control panel.

BURN OIL, GAS, OR BOTH

Superior Burners burn oil or gas or a combination of both... changing from one fuel to the other in seconds.

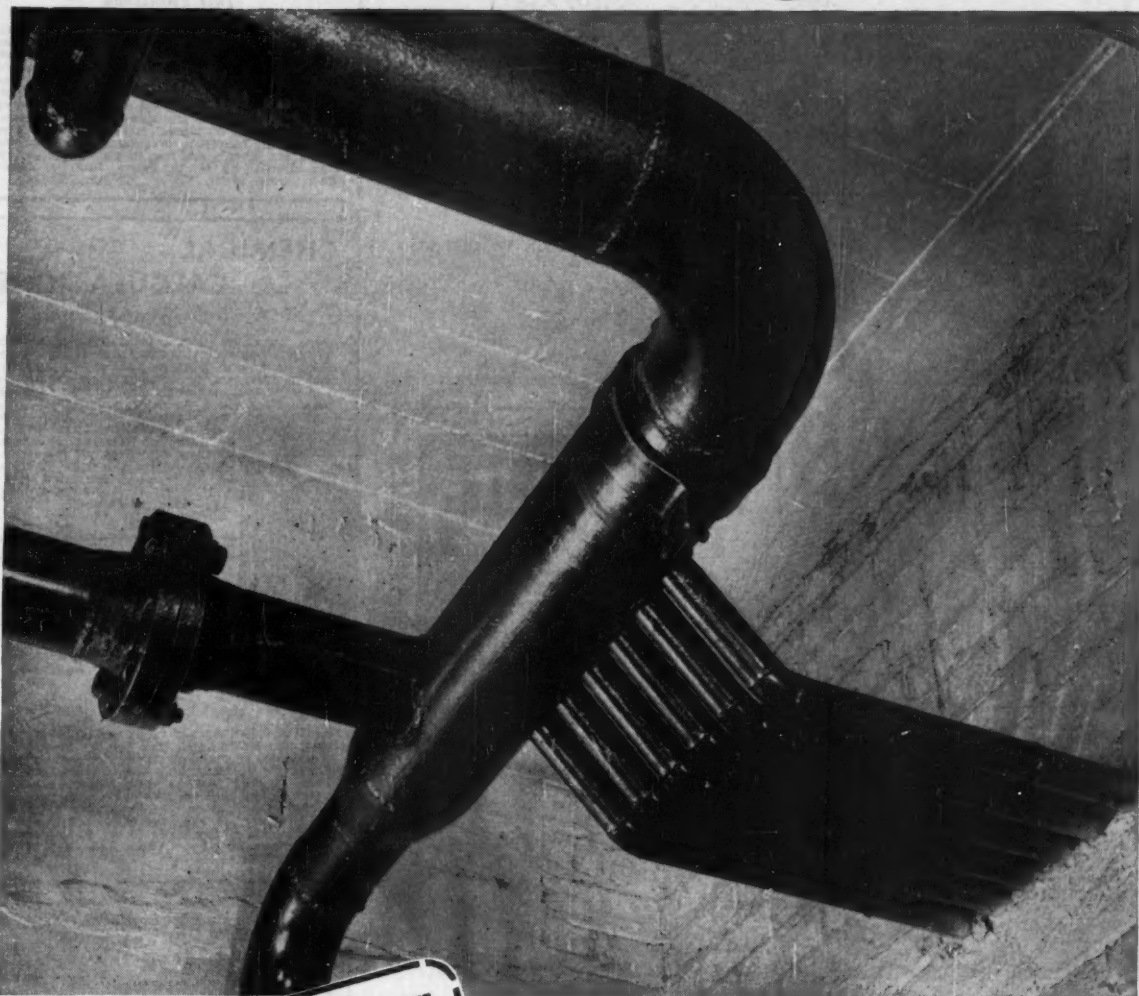
18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for Catalog 622-F. Water Tube types up to 40,000 lbs./hour write for Catalog 622-W.

for performance you can **BANK** on

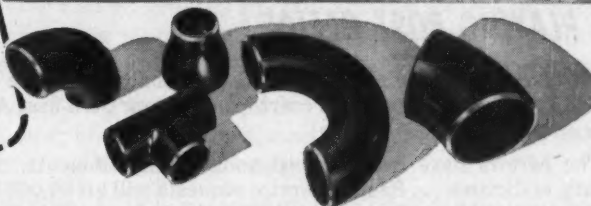


SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

How to Tame a Tough Joint



**ANOTHER JOB DONE
BETTER WITH GLOBE
WELDING FITTINGS**



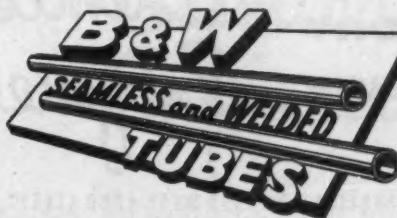
KEEP an eye on the future when you install piping—even the most innocent looking connection can become a "tough joint" through leakage — pressure-loss — the focal point for erosion and corrosion — constant maintenance time and cost.

You can tame probable "tough joints" in piping by making connections with permanently tight, leakproof Globe

Welding Fittings. Strength is forged in the fittings — flow friction and pressure-loss minimized by precision formed true angles, radii, circularity—weight and space requirements reduced—exact dimensional accuracy that saves time, speeds piping assembly. To do any piping job better — use Globe Precision-Process Welding Fittings.

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Fittings Department

3839 W. Burnham St. • Milwaukee 46, Wisconsin



DO

YOU

NEED

PRECISION

FILTERS?

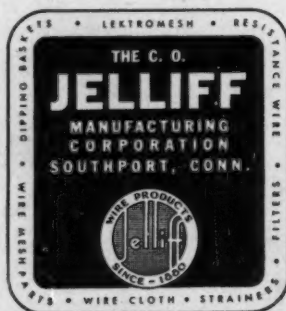
The smooth, tough surface of electro-deposited **LEKTROMESH** . .

the great uniformity of hole size — the wide range of commercial "mesh" sizes from 25 to 400 per inch—plus the fact that it can be stamped, cut, and even scraped without distortion of its mesh, all make

LEKTROMESH

ideal for precision filtration when you need pure nickel, pure copper, or a combination of copper-nickel.

Write Department 15



WE LIKE PLAYING POST OFFICE!

Don't blame us for grinning at those tired mailmen. We're happy 'cause you're flooding us with correspondence on CE's first *Annual Inventory Issue*.

The editors have been snowed under with comments, compliments, criticisms . . . Reader Service requests will hit 60,000 before the next issue's out . . . and thanks to you, we're getting plenty of new ideas for the 1955 edition.

Keep 'em coming . . . but hurry! Publishing date's October . . . and we want all the help we can get to make this year's *Inventory Issue* better'n ever.

**ANNUAL
INVENTORY
ISSUE**

Chemical ^{ABD} ^{ABC}
Engineering

A MCGRAW-HILL PUBLICATION, 330 WEST 42ND STREET, NEW YORK 36, N. Y.

ELEMENTARY CHEMICAL ENGINEERING

Just Published

A simply-written guide giving you broad over-all knowledge of chemical engineering that you need and use every day. Step by step, you are taken through basic chemical engineering unit operations—flow of fluids, heat transfer, evaporation, distillation, filtration etc. Production of sulfuric acid, fuel and industrial gases and electrolytic processes and nuclear reactions are described in basic terms. Includes details on piping, valves, fittings, pumps, steam traps, conveyors, evaporators, packings and driers, etc. Profits and cost in plant operation are also covered. By M. S. Peters, Prof. of Chem. Engr., Univ. of Ill. 322 pp., 65 illus., \$6.00.

CHEMICAL CALCULATIONS

Sixth Edition—Just Published

Gives you an understanding of the mathematical principles as applied to various chemical calculations. Improved 6th edition puts at your fingertips facts on such basic topics as: Mole-weight-gas volume relations, derivation of chemical formulas, chemical equations—nonredox, redox types, principle of equivalence, combination of gases, thermo-chemical reactions, electrochemistry, chemical equilibrium, ionization constants, common-ion effect, pH value solubility product principle. Contains problems to help you review applications. By H. V. Anderson, Prof. of Chem., Lehigh Univ., 320 pp., 415 illus., \$4.75.

CHEMICAL ENGINEERING

**Volume 1 — Fluid Flow,
Heat Transfer and Mass
Transfer**

Just Published

A detailed treatment of fundamentals of important chemical mechanisms like energy relationships, friction in pipe and channels, flow measurement, pumps for chemical works, momentum, heat and mass transfer, boundary layer, humidification and water cooling. Points the way to applications and solutions of many problems arising in unit operations. Many comprehensive tables and charts. By J. M. Coulson, Reader in Chem. Eng. and J. R. Richardson, Lecturer in Chem. Eng., both Imperial College. 370 pp., 166 illus., \$7.50.

MODERN PHYSICS FOR THE ENGINEER

Just Published. Nineteen eminent scientists explore with you the basic physical sciences on which our engineering society is built. Written especially for the engineer, the book goes beyond providing a merely "popular" account of physics, and shows the interesting developments, achievements, and methods used in the various "pure" sciences. Edited by L. N. Ridenour, Vice-President, International Telemeter Corp. 490 pp., 211 illus., \$7.50.

SEE THESE BOOKS 10 DAYS FREE

McGraw-Hill Book Co., Dept. CE-2
330 W. 42, NYC 36

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus few cents for delivery, and return unwanted book(s) postpaid. (We pay for delivery if you remit with this coupon—same return privileges.)

☐ Peters—Elem. Chem. Engineering—\$6.00
☐ Anderson—Chemical Calculations—\$4.75
☐ Coulson—Chemical Engineering—\$7.50
☐ Ridenour—Modern Physics f. Engr.—\$7.50
(Print)
Name

Address

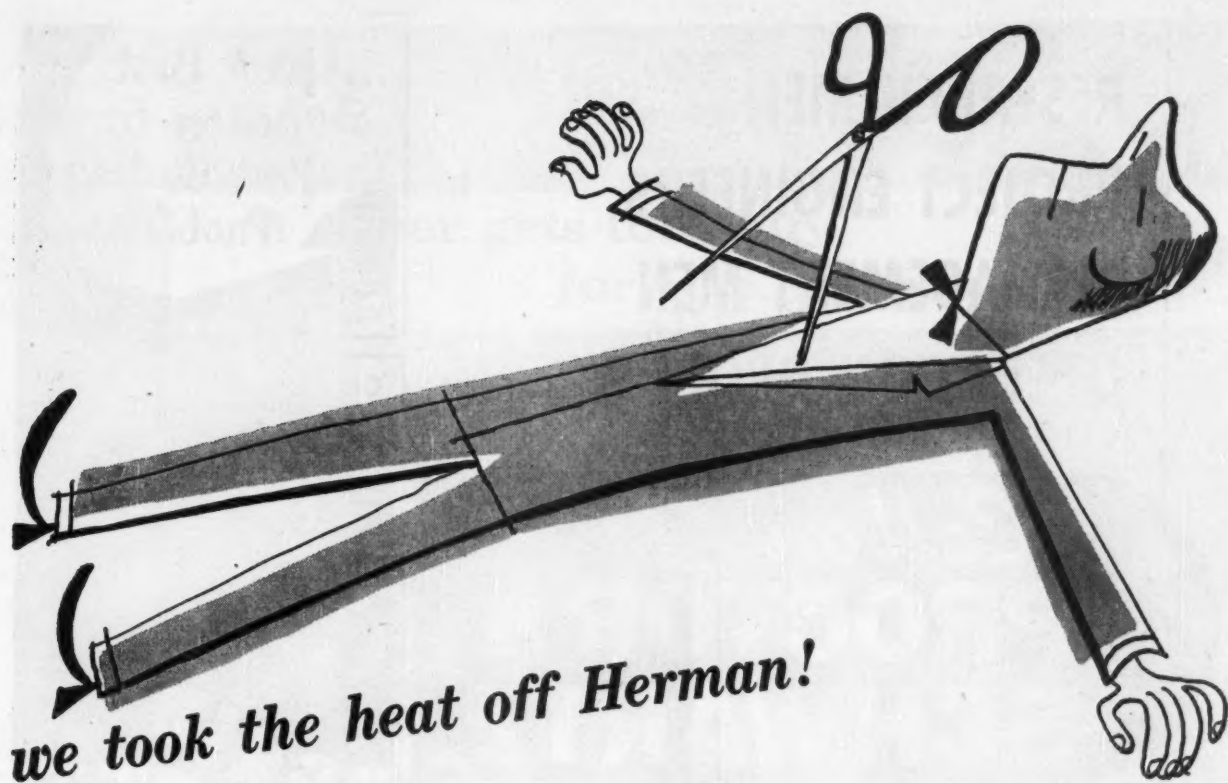
City Zone State

Company

Position

For price and terms outside U. S.
write McGraw-Hill Int'l., N.Y.C.

CE-2



Saved him from a horrible end, he says. From what Herman, a refinery supervisor down Houston way tells us, CE's *Inventory Issue* kiboshed a CPI tragedy right in his own home.

Seems his wife was pretty proud of her sewing. So was Herman — always talking it up at the plant about how much dough she saved on clothes. Only trouble was, she just had one pair of scissors, and Herman was forever borrowing 'em to cut out reading material from **CHEMICAL ENGINEERING**.

The day the *Inventory Issue* arrived though, he knew his snippers-snitchin' days were over. Saw right away how it wrapped up 12-months' key developments and eliminated his clip-and-file system in one fell swoop. New technologies, new plants, new chemicals and equipment, that wonderfully convenient Reader Service . . . *the works!* He was in ecstasy.

Couldn't understand when he told his wife about it though. She just up and fainted. Later, he keeled over himself when he found out she'd planned a scissorcide the next time he grabbed her shears.

But all's well now. A little vacation did the trick for mama. Today there's no happier CPI couple east of the Pecos. No snips around the house though — the little lady's clothes are all store-bought. And the only bragging Herman does at the plant is about *how much time he saves* . . . with the *Annual Inventory Issue* of **CHEMICAL ENGINEERING**.

ANNUAL INVENTORY ISSUE

Chemical 
Engineering 

A MCGRAW-HILL PUBLICATION, 330 WEST 42ND STREET, NEW YORK 36, N. Y.

CHEMICAL ENGINEERING—February 1955

369

- RESEARCH MEN
- PROJECT ENGINEERS
- MANAGEMENT MEN
- OPERATION GROUPS

Call on
**PROCTOR &
 SCHWARTZ**

to gain advantages of an organization
 with largest aggregate of

"EXPERIENCE YEARS"

in application of drying equipment
 in the chemical industry

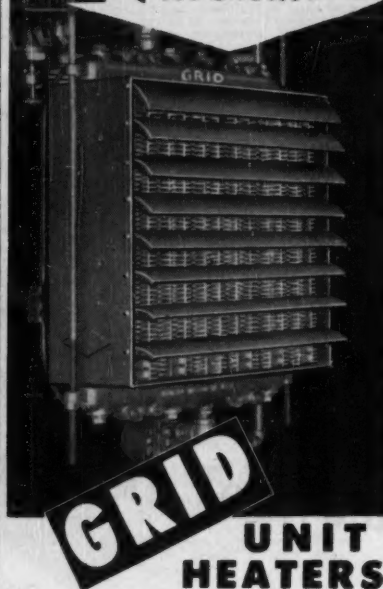
PROCTOR equipment is at work in all branches of the
 process industries: heavy chemicals, pharmaceuticals,
 plastics, foods, leather, synthetic textiles, rubber manufac-
 turing, glue and gelatin, and many other related industries.

PHONE MICHIGAN 4-6400 OR WRITE

**PROCTOR &
 SCHWARTZ INC.**

711 TABOR ROAD
 PHILADELPHIA 20, PA.

*...Your Best
 Solution to
 Your Heating
 Problems*



**UNIT
 HEATERS**

*Cast Iron Construction
 That Stands Up Against
 Corrosive Fumes In
 Chemical Plants! **

If your heating installations are not performing satisfactorily investigate GRID Unit Heaters—trouble-free service for over 23 years—a record possible because: GRID, the completely different unit heater, is an all-cast unit with finned heating sections and header tested to withstand steam pressures up to 250 lbs. P.S.I. GRID cast iron construction stands up well against corrosive acid fumes of HCl, Cl₂, etc., plus these features of construction:

No brazed, soldered, rolled or welded connections between condenser and headers.

All similar metals in contact with steam . . . no electrolytic corrosion which eventually occurs in copper type unit heaters where steam passes from iron pipes into copper cores.

Low outlet temperatures, proper fan sizes and motor speeds, assure delivery of warm comfortable air in ample volume to working level . . . no stratification of warm air at the ceiling to waste your fuel dollars.

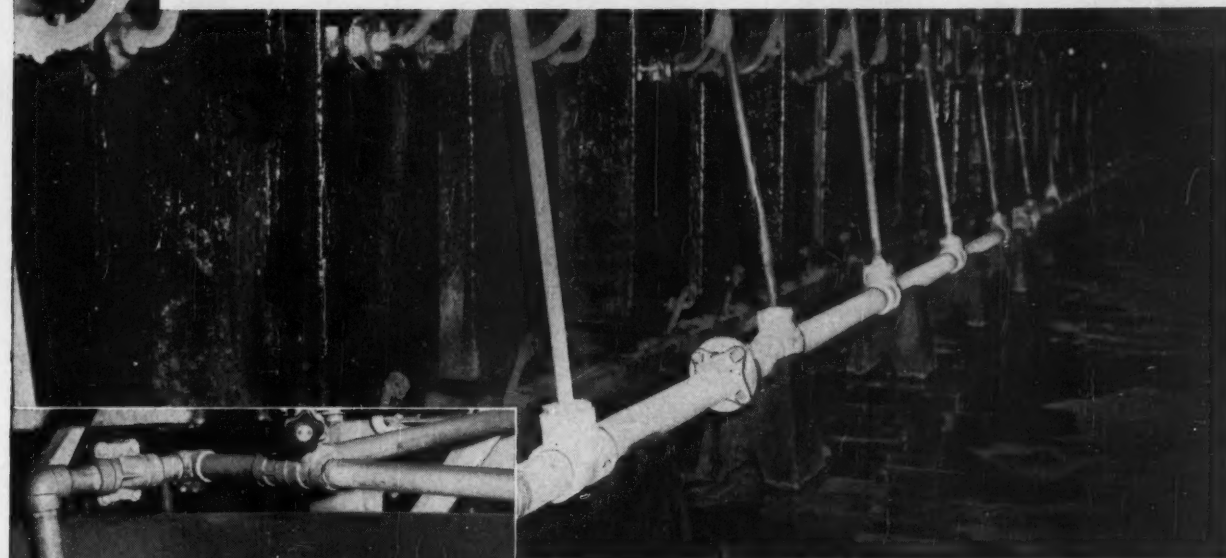


Write for complete catalog
 . . . also ask about GRID blast
 coils that are ideal for many
 uses throughout chemical pro-
 cessing industries (catalog EC-
 1049).

**D. J. MURRAY
 MANUFACTURING CO.**

Manufacturers Since 1883
 WAUSAU - WISCONSIN

It never gets too salty for U. S. Uscolite Pipe!



View of cell room. The Uscolite piping feeds the brine into electrolytic cells, where it is broken down into caustic soda, chlorine and hydrogen.

Uscolite pipe carrying sodium hypochlorite to a storage tank lined with U. S. Permabond® corrosion-resistant lining.

Controlling highly corrosive brine was a major problem for a Providence, R. I., maker of chlorine products. The brine attacked the piping and replacements had to be made every 6 months. In addition, corrosive fumes shortened the life of another piping system in the plant.

Then U. S. Uscolite® Plastic Pipe was installed. Result: no signs of corrosion of any kind, in either piping system—even after over a year of operation. Savings in piping replacement and maintenance will continue for an indefinite time.

A product of United States Rubber Company, U. S. Uscolite Pipe has great impact strength. Yet it's very light in weight. It's available also in pipe fittings, valves, and sheet stock for fume ducts—will resist acids, salts, alkalies and gases, inside and out.

For replacement or completely new piping, get in touch with any of the 27 "U. S." District Sales Offices, or write address below.

Uscolite pipe and fittings are made in the broadest and largest line of stock sizes on the market. Sizes follow:

- Molded fittings in ½" through 4" I.P.S. ● Molded flanges ½" to 6" I.P.S. ● ½" to 3" Uscolite diaphragm valve (Hills-McCanna).
- Header pipes in 2", 3", 4", 6" pipe sizes. ● Pipe in standard wall dimensions and extra heavy wall dimensions in ½" through 6" pipe sizes.

"U. S." Research perfects it...

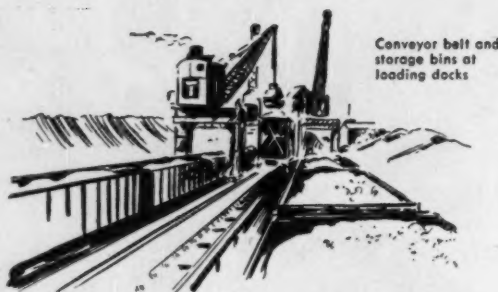
"U. S." Production builds it...

U. S. Industry depends on it.



UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes
Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting



Conveyor belt and
storage bins at
loading docks

Crude Sulphur

for Industrial Use

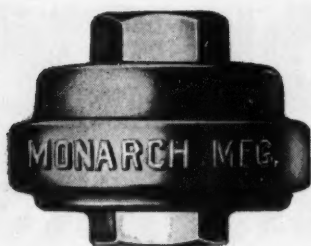
*from
the
properties
of*

Texas Gulf Sulphur Co.

75 East 45th Street • New York 17, N. Y.

Producing Units

- NEWGULF, TEXAS
- MOSS BLUFF, TEXAS
- SPINDLETOP, TEXAS
- WORLAND, WYOMING



SCRUBBING CORROSIVE GASES ?

Are your scrubbing nozzles as efficient as you think they could be? Do they resist the corrosion or wear conditions satisfactorily—produce the breakup and distribution you would like?

Outline your spray problem for us—if your liquid can be sprayed with direct pressure at all—Monarch can furnish the nozzles.

NOZZLES FOR:

- OIL ATOMIZING
- HUMIDIFYING
- AIR WASHING
- DESUPERHEATING
- SPRAY PONDS
- MILK POWDERING
- ACID CHAMBERS
- CONCRETE CURING

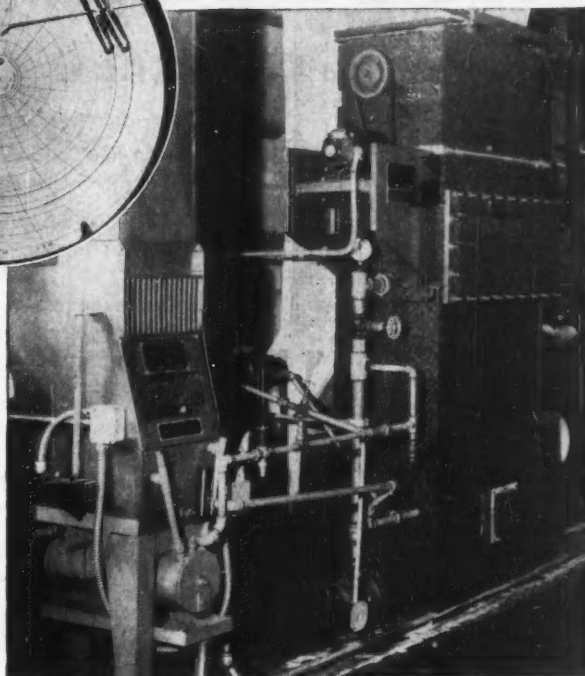
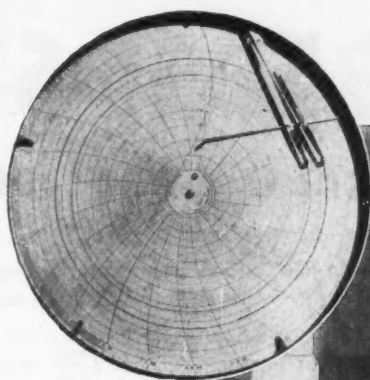
Write for Catalogs 6-A and 6-C

Monarch

MFG. WORKS, INC.

2517 E. ONTARIO ST.
PHILADELPHIA 34, PA.

EXACT CONTROL of Moisture Content



**... To Improve Your Product or Protect
Your Materials or for Processes or Tests**

● This Niagara Air Conditioning Method dries air directly and measurably, using a moisture-absorbing liquid spray. It makes humidity control a separate function from lowering or raising temperatures and gives you precise control with thermostats alone; no moisture-sensitive devices are needed. You have simpler, more trustworthy, less expensive control instrumentation. Niagara precise-control installations have the best record for reliability.

Niagara Air Conditioning provides you with any temperature and relative humidity you need. Using "Hygrol" absorbent, it is not expensive to operate, saving the refrigeration commonly used to condense moisture and making re-heat unnecessary in most cases. It gives large capacity with compact, easily-maintained equipment. Ask for Descriptive Bulletins #112 and #121. Address Dept. CE.

NIAGARA BLOWER COMPANY

405 Lexington Ave.

New York 17, N. Y.

District Engineers in Principal Cities of U. S. and Canada

ALLEN-BRADLEY TROUBLE FREE STARTERS

for the CHEMICAL and PROCESS INDUSTRIES

Wherever you find outstanding industrial equipment, you will discover reliable Allen-Bradley motor control. There is a reason!

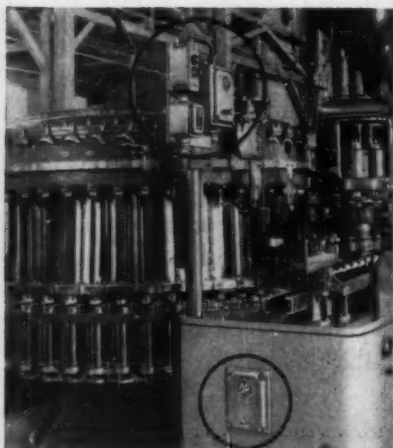
The simple solenoid design—only ONE moving part—is your reliable guarantee for millions of trouble free operations. When you eliminate moving or wearing parts like pins, pivots, linkages, and bearings, you automatically eliminate possibilities for trouble. Also, Allen-Bradley controls require no contact maintenance. The double break, silver alloy contacts never need filing, cleaning, or dressing. Nor is regular inspection necessary! The contacts are always in perfect operating condition.

Thus, in explosive, dusty, or moist atmospheres, it pays to install Allen-Bradley starters in the correct enclosure. Because Allen-Bradley solenoid controls do not require regular inspection, time lost in removing and replacing bolted covers is substantially reduced. Ask any maintenance man!

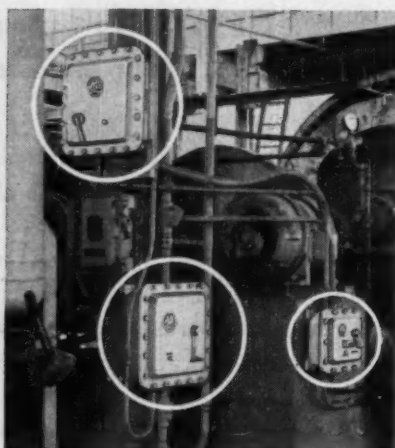
You cannot buy Allen-Bradley control for less money, but its "Quality" will begin to save you money from the time it is installed!

Allen-Bradley Co., 1337 S. First St., Milwaukee 4, Wisconsin

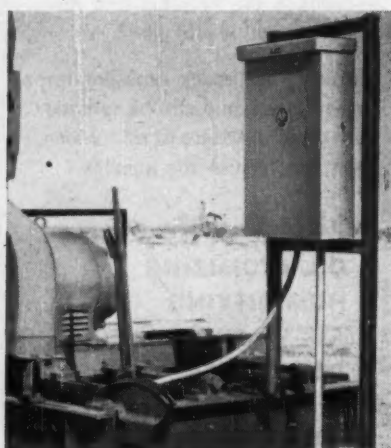
In Canada—Allen-Bradley Canada Limited, Galt, Ontario



Bottle filler operated with Allen-Bradley controls in NEMA 4 watertight enclosures.



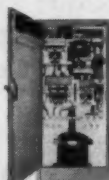
A-B controls in NEMA 7 enclosures for explosive atmospheres installed on ball mill.



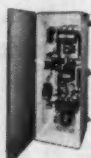
In oil field, Allen-Bradley Pump Control Panel in weathertight enclosure.

Typical Starters

*The Sign
of Quality*



Synchronous Starter



Reduced Voltage Starter



High Voltage Starter



Control Center



Solenoid Starter

Allen-Bradley Solenoid Motor Control



handle acids
safely with . . .
**JERGUSON
LINED GAGES**

Lined Gage shown
with lined blind
cover flanges.

WHERE concentration of liquids such as sulphuric, muriatic or other acids necessitates equipment with special linings, Jerguson can furnish you with reflex or transparent gages lined with natural and synthetic rubbers, lead, phenolic base compounds, Teflon, and other materials. Jerguson Lined Gages are designed to meet your requirements of long-life and dependable operation.

To meet your constantly increasing variety of demands, Jerguson engineers, working closely with the men in the Chemical and Petrochemical Fields, have developed a complete line of sound, dependable liquid level gages, valves, and specialties in various metals and synthetics to handle corrosive liquids and gases.

Jerguson Gages keep you out of trouble, and they save you time and money. Send for drawing GD-431 on Lined Gages, or send your requirements.

JERGUSON

*Gages and Valves for the
Observation of Liquids and Levels*

JERGUSON GAGE & VALVE COMPANY
100 Fellsway, Somerville 45, Mass.

Offices in Major Cities

Jerguson Tress Gage & Valve Co., Ltd., London, Eng.
Pétrole Service, Paris, France

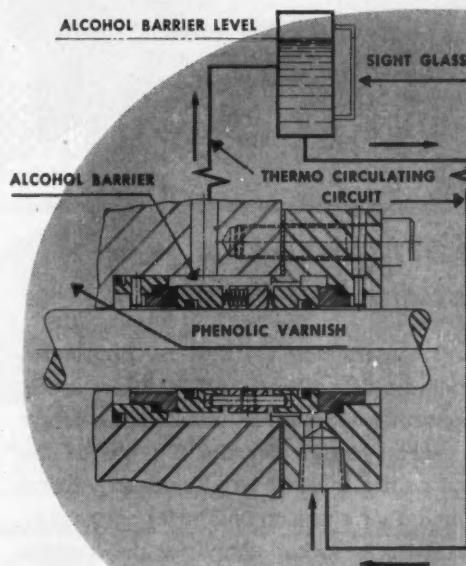
HOW TO SEAL A VARNISH PUMP

PROBLEM

Seal the impeller shaft of a centrifugal pump delivering varnish at 150 psig. Insure long seal life by preventing the penetration and subsequent hardening of varnish inside the pump seal.

SOLUTION

The Sealol answer to this problem is a double Sealol SGDC seal using alcohol as a fluid barrier. A slight back-pressure of the alcohol insures a film of clean fluid between the seal faces at all times, keeping the varnish out of the moving parts, even after pump shut-down. Continuous recirculation of alcohol protects the seal from over-heating.



OTHER MATERIALS SEALED? Plenty of them! Sealol-Flexibox Seals are handling acids, hydrocarbons, chlorinated hydrocarbons, esters, ketones, alcohols, slurries, salts, antibiotics, and many other materials. What are your pumps handling? Sealol is ready to work with you on all types of shaft sealing problems. Write today giving job description, or ask for Bulletin 9.

SEALOL

SEALOL CORPORATION
183 POST ROAD
PROVIDENCE 5, R. I.

THE BALANCED PRESSURE SEAL

New York • Philadelphia • Chicago • Cleveland • Houston • San Francisco
Los Angeles • Kansas City (Mo.) • Charleston (W. Va.) • St. Louis
Tulsa • Edmonton (Can.) • Manchester (Eng.) • Paris • Frankfurt

FILTRATION

ANY SOLUTION
ANY QUANTITY

INDUSTRIAL
Filters



Bonus Performance with Lasting Reliability

The engineering and construction features of INDUSTRIAL filters add up to maximum clear filtrate with less floor space, greater operating conveniences, and less maintenance delays and expense. The general design permits the use of the materials best suited to the solution requirements. Vertical filter leaves with ample flow space on both sides offer maximum filtration area. Outside lockup simplifies the installation of filter leaf and bag assemblies. An exclusive air-wash cleaning method practically eliminates the usual labor and inconvenience of dismantling the filter after every cycle. INDUSTRIAL filters are often in operation for months without removing the cover — cutting downtime to a minimum. All these features have been proved in long-life service — your assurance of dependable bonus performance.

Full particulars and recommendations on any filtration job will be given upon request.

INDUSTRIAL
FILTER & PUMP MFG. CO.
5918 Ogden Avenue, Chicago 50, Illinois

PRESSURE FILTERS
DEMINERALIZERS
RUBBER LININGS



'scuse us
for being chesty, but...

... we just can't help crowing about reader-response to CE's first Annual Inventory Issue.

A chemical engineer from Brooklyn calls it . . . "invaluable already, and without precedent." A South Carolina plant manager stopped in to tell us . . . "Yo'all done yo'self real proud." A Dallas man swears . . . "the editor musta come from Texas."

Others went into greater detail—on content, arrangement of editorial sections, Reader Service—even the quality of the advertising. Comments and opinions were all over the lot. And they're still coming in.

What do you say? It's your magazine and we're wide open for suggestions. We'd like your ideas . . . for the 1955 Annual Inventory Issue of CHEMICAL ENGINEERING.

ANNUAL INVENTORY ISSUE

*Chemical
Engineering*



A McGraw-Hill Publication, 330 W. 42nd St., New York 36, N. Y.



Respiratory Protection

Be Wise—Economize— Standardize—Simplify Stock Problems —with the **AO† R5000** Respirator*

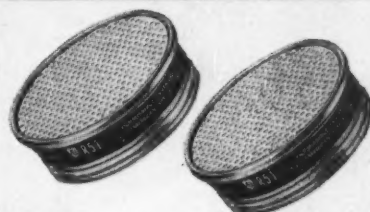
Here's *complete* respiratory protection in one "package"! If you have several respiratory hazards to control, the AO R5000 will save you inventory problems and money. This ingenious twin cartridge respirator converts to many types of protection quickly merely by interchanging the filters and cartridges. Ask your nearest AO Safety Products Representative.



R50 — For combination of all dusts, not significantly more toxic than lead. B.M.2156



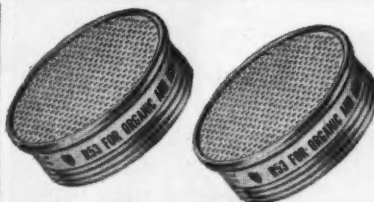
R50A — used with R50, converts to a dust and mist respirator. Protects against all dusts not significantly more toxic than lead, pneumoconiosis-producing mists, chromic acid mists. B.M. 2156 includes B.M.2156A



R51 — For light organic vapors and gases of paint spraying, degreasing, dry cleaning. B.M.2304



R52 — For acid gases, and mists of plating operations, pickling tanks, etc.



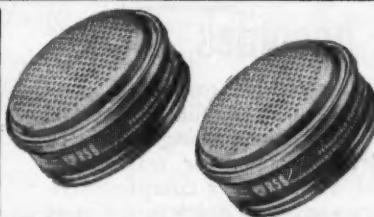
R53 — For combined acid and organic gases like carbon tetrachloride and acetic acid.



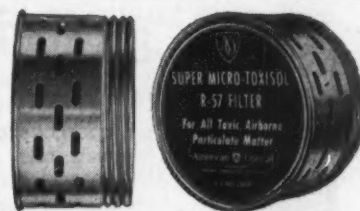
R54 — For protection against low or nuisance concentrations of ammonia.



R55 — For those who are exposed to both organic vapors and all dusts not significantly more toxic than lead. B.M.2305



R56 — For fumes produced in welding, burning, smelting and refining. B.M.2163



R57 — For dusts, mists, fumes, significantly more toxic than lead including radioactive particulate matter.



*One Face Piece
Takes 9 Filters
and Cartridges

†T.M. Reg. by American Optical Company

American Optical



SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Time to look at weighing!



... on your scales material becomes money



Dials on new Toledos can be faced any of 8 ways for operator convenience or full 360° swivel.

Look to Toledo for new ideas to help you control costs! Good weighing is a fundamental of good cost control; basic accounting records of materials received, shipped or transferred start at the scale. In Toledo's complete line there is a modern answer to every problem of industrial weighing . . . in standard, or in custom-built units. When you look at costs . . . it's time to look at your weighing. There's a Toledo office as close as your phone. Toledo Scale Company, Toledo 1, Ohio.

**Write for new condensed catalog No. 2001.*

TOLEDO®
HEADQUARTERS FOR SCALES



**IT
TAKES
TWO**

DISPLAY ADVERTISING

- AROUSES INTEREST
- CREATES PREFERENCE

DIRECT MAIL

- GETS PERSONAL ATTENTION
- TRIGGERS ACTION

After your prospect has been convinced by DISPLAY ADVERTISING, he still must take one giant step. He must act. A personalized mailing piece direct to his desk, in conjunction with a display campaign, is a powerful action getter.

McGraw-Hill has a Direct Mail Division ready to serve you with over 150 specialized lists in the Industrial field.

To get your copy of our free INDUSTRIAL DIRECT MAIL CATALOGUE (1954) containing complete, detailed information about our services, fill in the coupon below and mail it to McGraw-Hill.

Do it now! The best advertising programs are planned well in advance.



Direct Mail Division,
McGraw-Hill Publishing Co., Inc.
330 West 42nd St., N. Y. 36, N. Y.

Please forward my free copy of the McGraw-Hill "Industrial Direct Mail Catalogue."

Name _____

Company _____

Address _____

City _____ State _____



tt
TUBE-TURN
TRADE MARK

Remember — the trade marks "tt"
and "TUBE-TURN" are applicable only
to products of TUBE TURNS.

**You get
extra strength
with
The Leading Brand**

TUBE-TURN* WELDING TEES are drawn from seamless tubing to a barrel shape. This, and other design features produce high strength—averaging over 25% more than required by applicable standards.

Specify TUBE-TURN Welding Fittings and Flanges for extra values: superior products, the exact fitting or flange you need from our complete line, outstanding engineering service. Call your nearby Tube Turns' Distributor. He is at your service!

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS

**LOUISVILLE 1,
KENTUCKY**

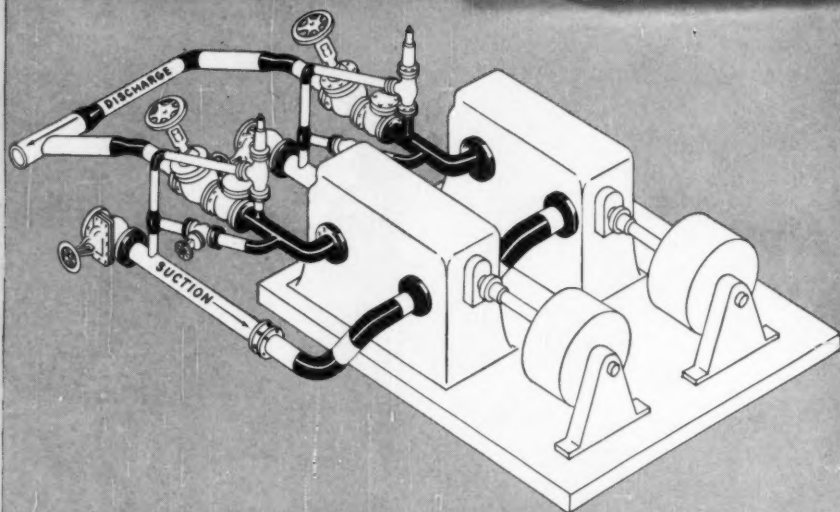
A DIVISION OF NATIONAL CYLINDER GAS COMPANY

DISTRICT OFFICES: New York • Philadelphia • Cleveland • Toledo • Chicago • Denver • Los Angeles
San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

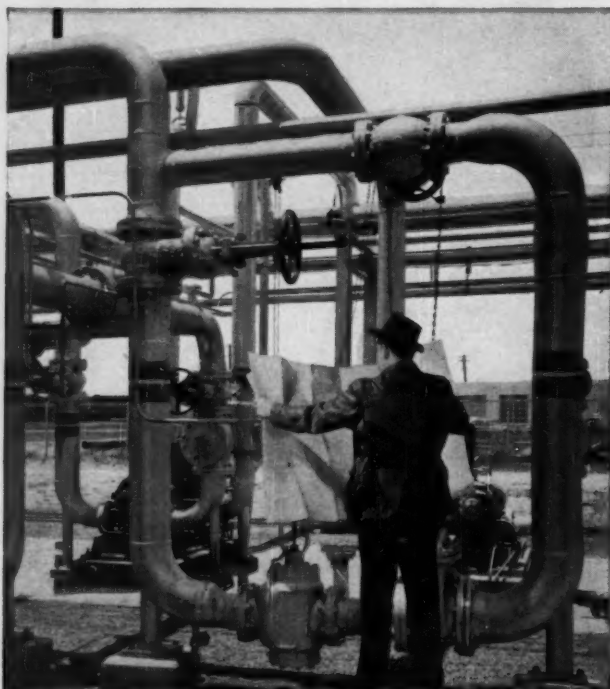


EXTRA VALUES

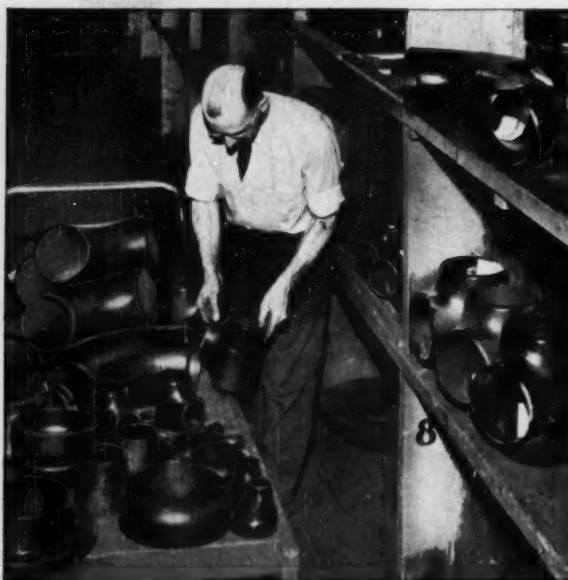
Speed up your piping jobs with **TUBE TURNS' SERVICE**



ENGINEERING SERVICE—Tube Turns' Engineering Service can help you on your piping projects. For example: Diagram above shows an application where TUBE-TURN® Welding Fittings and Flanges simplified the design and erection of pump piping. They save time, save space, and make the piping permanently leakproof and reliable. Ask your Tube Turns' Distributor to give you the pump piping recommendations of Engineering Service.



COMPLETE LINE SERVICE—You can make sure of getting the right fitting for each job when you specify "TUBE-TURN". This is the world's most complete line of welding fittings and flanges, including more than 4000 items, in all piping materials, schedules, and sizes.



AVAILABILITY—Your nearby Tube Turns' Distributor carries local stocks for fast delivery. Call him for good service in good connections.

Technical data service

Tube Turns is recognized as a leading source of authoritative information on piping design. For booklet on "Allowable Working Pressures" fill out and mail the coupon now.



TUBE TURNS, Dept. H-1
224 East Broadway, Louisville 1, Kentucky

Please send free copy of "Allowable Working Pressures"

Company Name _____

Company Address _____

City _____ Zone _____ State _____

Your Name _____

Position _____



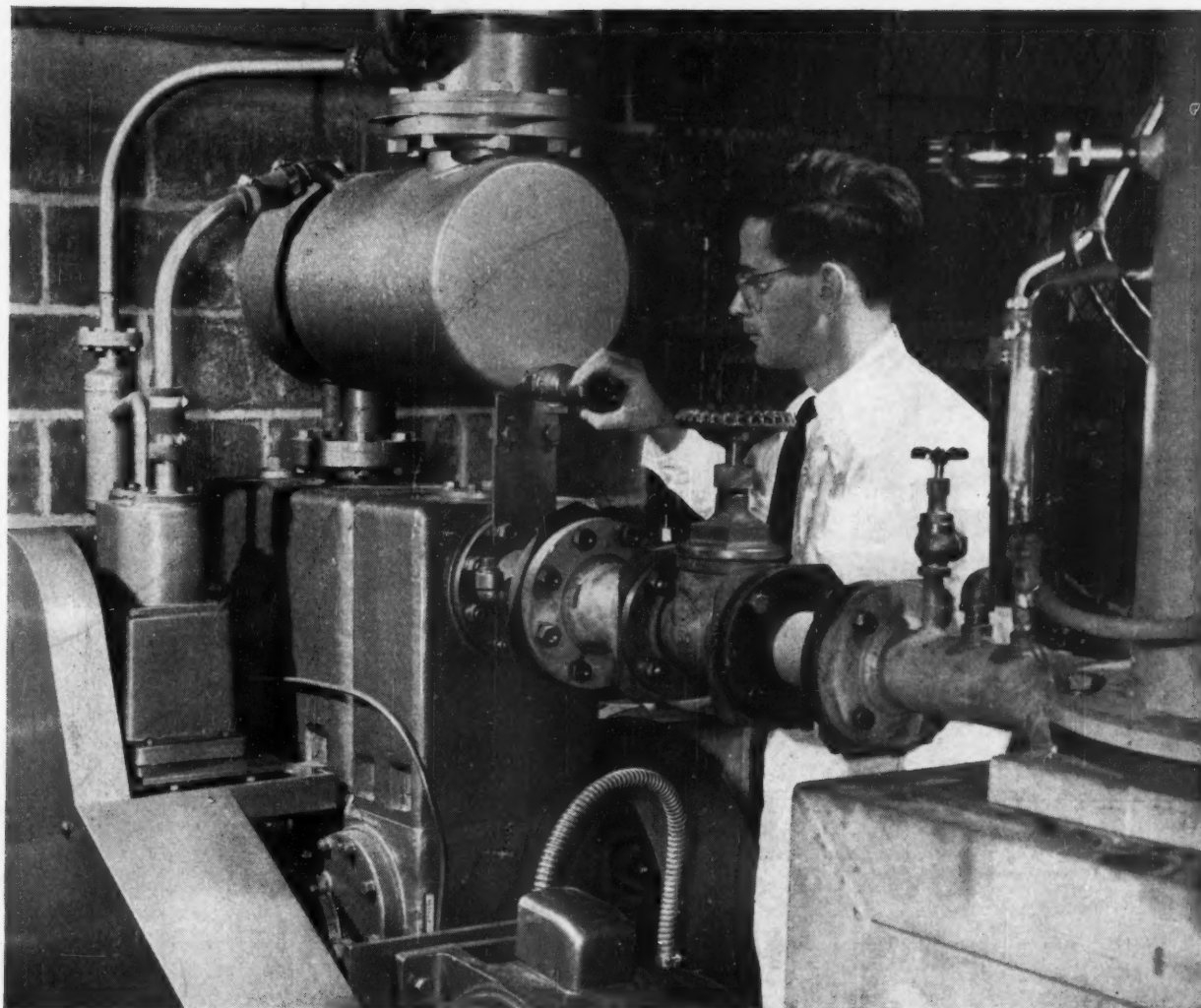
DISTRICT OFFICES

New York	San Francisco
Philadelphia	Seattle
Cleveland	Atlanta
Chicago	Tulsa
Denver	Houston
Los Angeles	Dallas
	Midland, Texas

* "tt" and "TUBE-TURN" Reg. U.S. Pat. Off.

TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY
LOUISVILLE 1, KENTUCKY



Here's the Only Vacuum Pump Proved to Pump Water Vapor, too!

On just one humid day a mechanical vacuum pump may be asked to digest moisture-laden air containing over two gallons of water. If this or any other vapor is allowed to condense in the pump oil, pump down cycles become longer and longer and longer — a real production "headache". An oil change, a costly and time consuming operation, is required to restore pump efficiency.

Only NRC Rotary Gas Ballast Pumps have proved — on thousands of installations — that they keep their original high efficiency even when pumping troublesome vapors.

Here is the reason: only NRC pumps have been designed around the *gas ballast* principle, which, with other design features, prevents condensation ... keeps oil clean ... maintains original fast pump down time day after day. Send for Bulletin.

This is the NRC Rotary Gas Ballast Combination Pump Model NRC 200M. Other single and compound units with capacities from 1¼ to 400 CFM; blank-offs down to 5×10^{-5} mm. Hg.

SALES OFFICES
Boston, Chicago, Cleveland,
Los Angeles, New York,
Palo Alto, Philadelphia;
in Canada: Toronto, Arnprior

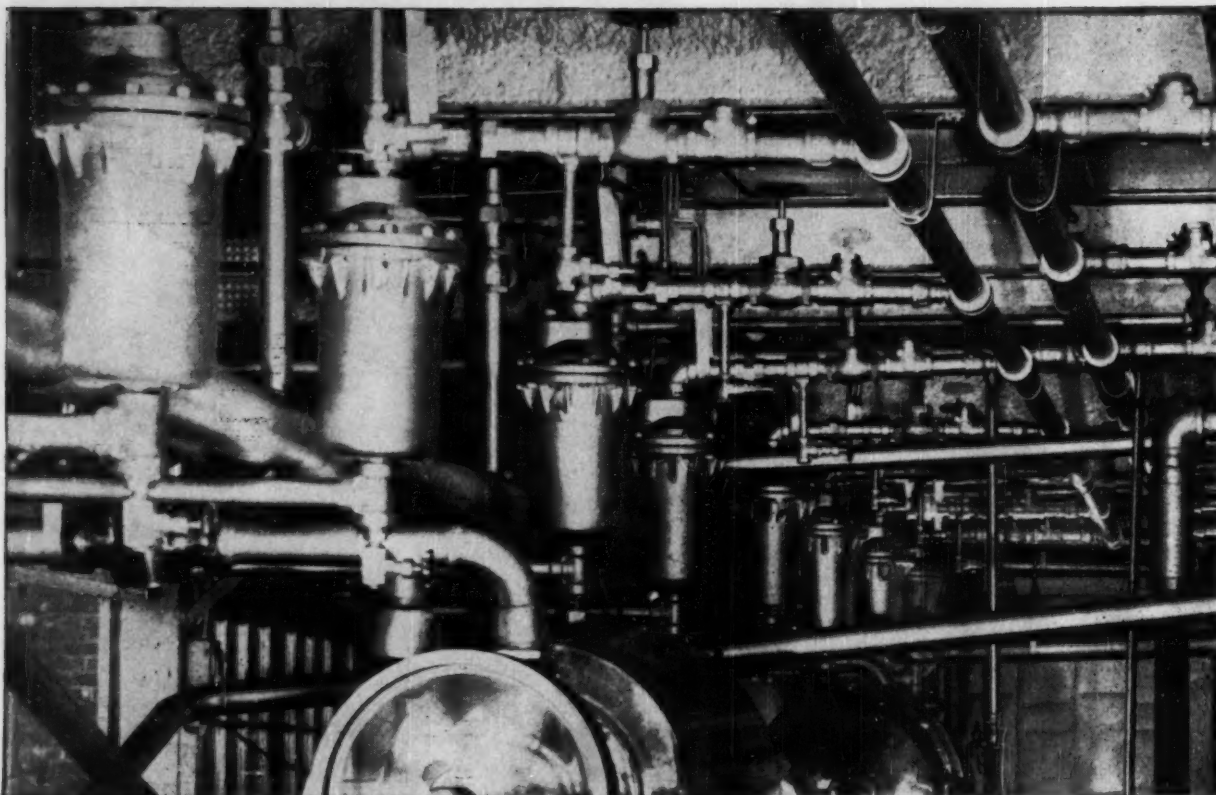


NARESCO EQUIPMENT CORPORATION

Equipment Sales Subsidiary of National Research Corporation
52 Charlemont St., Newton Highlands 61, Mass.

Please send me the NRC Rotary Gas Ballast Pump Bulletin.

Name _____ Title _____
Company _____
Address _____
City _____ State _____



How To Increase Production and Still Use Less Fuel!

Problem—Cooking kettles at National Cranberry Company, South Hanson, Mass., couldn't produce enough to supply three recently speeded up canning lines. There was neither enough space nor steam supply capacity to add more kettles. Might there be another answer?

Solution—Mr. Russell Appling, Production Manager, made a very logical move, with everything to gain and nothing to lose. He called his local Armstrong Representative to talk about re-trapping his set-up. The existing traps were replaced with Armstrong 2" No. 216 large vent traps, one on each of the 8 kettles. Additionally, the steam lines were trapped to assure a dry steam supply.

Results—30% more kettle production. A fourth canning line was added to keep up with output. And, fuel consumption dropped 30% despite the production increase!

If you want more efficient production, greater return on equipment investment, why not call *your* Armstrong Representative. See your classified phone directory or Thomas Register, or write:

ARMSTRONG MACHINE WORKS
858 Maple Street, Three Rivers, Michigan

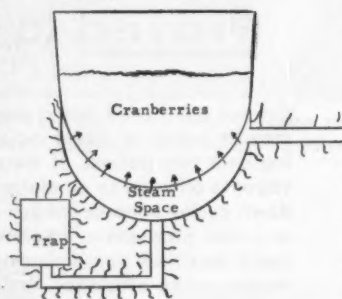


Application Engineered

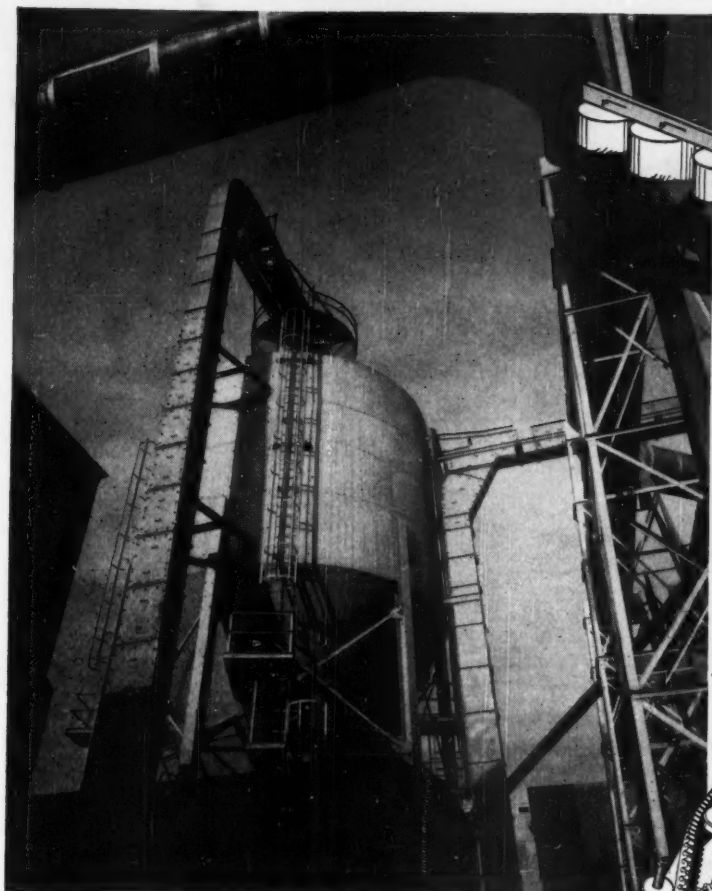
ASK FOR
STEAMTRAP
BOOK

ARMSTRONG STEAM TRAPS

HOW A KETTLE CAN GIVE 30% MORE OUTPUT WITH 30% LESS FUEL



Assume that with trap "X", inadequate for the job, cooking time is 10 minutes. During that period heat is radiating (wavy lines) from supply lines, kettle and trap. This non-productive heat loss wastes steam. Now, with an Armstrong trap keeping the steam space free of air and condensate, heat transfer rate is fast and cooking is done in 6 minutes. Thus, four minutes of non-productive radiation loss is eliminated—the faster cooking actually saves steam.

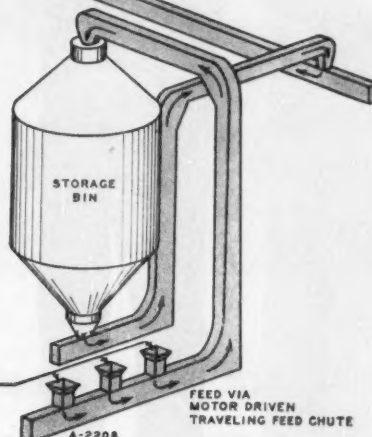


General view of S-A Zipper Conveyor-Elevator System for handling carbon black. Since the Zipper units operate in the open, they are protected from the weather by steel casings.

DISCHARGE VIA
MOTOR DRIVEN
TRAVELING DISCHARGER

ZIPPER
CARBON BLACK
HANDLING SYSTEM
FOR
DAYTON RUBBER COMPANY

STORAGE
TANKS OVER
MIXERS



Sketch illustrates flow of carbon black through storage to processing via three ZIPPER belt conveyor-elevators. Note unit feeding from track hoppers which operates in two planes.

Zipper belt teeth are automatically spread, meshed and locked by means of ball bearing rollers as the belt travels past the feeding station.

Push Buttons Route Carbon Black Through Dust-Tight Zipper Distributing System

Remote control plus complete mechanization keynotes this conveying and storage system at the Dayton Rubber Company's Dayton, Ohio plant. Push buttons replace bag handlers—a single operator at a centralized control panel directs the 7-ton-per-hour flow of carbon black from hopper bottom rail cars, through storage, reclaiming and delivery to mixers in the plant.

Besides eliminating the excessive cost of handling the carbon black in bags, the system has greatly reduced degradation of the pelletized black and has practically done away with dust.

Incoming cars are spotted over the Zipper stor-

age conveyor, which feeds from each one of the three track hoppers progressively selected at the control panel. At the 8-compartment storage bin, a motor driven swivel spout directs the flow of black to the proper compartment. In reclaiming, from storage, a Zipper Conveyor-Elevator discharges to a 238-foot Zipper that provides selective filling of the mixer storage bins.

If you have a dust or degradation problem, find out how much an S-A Zipper System offers you. Send for full data now.

STEPHENS-ADAMSON MFG. CO.

3 Ridgeway Avenue, Aurora, Illinois
Los Angeles, Calif., Belleville, Ontario

Engineering
Division

Standard Products
Division

Sealmaster Division

Specialists in the design and manufacture of all types of bulk materials conveying systems.

A complete line of conveyor accessories including centrifugal loaders—car pullers—bin level controls—etc.

A complete line of industrial ball bearing units available in both standard and special housings.



STEPHENS-ADAMSON MFG. COMPANY

3 Ridgeway Avenue, Aurora, Illinois

Please send us Bulletin No. 349 on ZIPPER Conveyors

Name

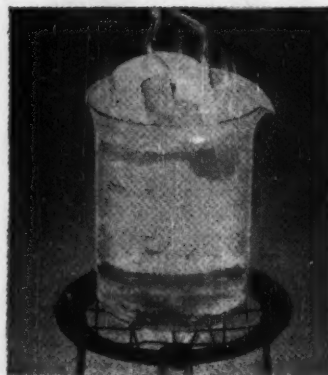
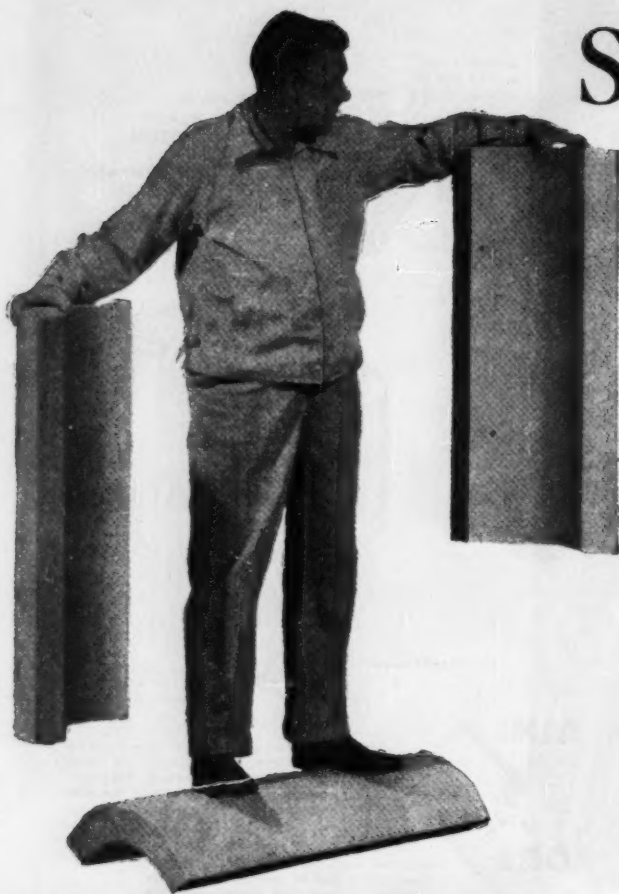
Company

Address

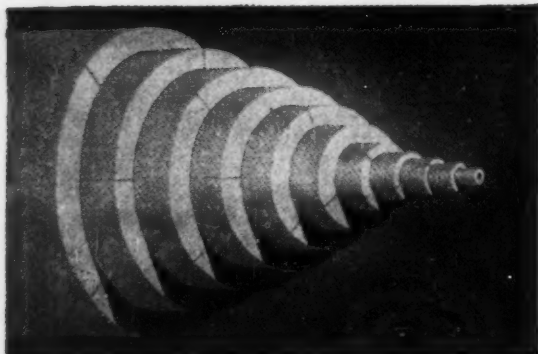
City Zone State

strength...

just one of
many reasons why
Kaylo® is the king
of high temperature
insulations



Boiling water will not break Kaylo down. When soaked, it retains much of its strength. Dried, it returns to its original thermal efficiency.



Snug nesting where necessary. O. D.'s of Kaylo insulation correspond to O. D.'s of standard pipes from ½" to 23", assuring proper fit and nesting where necessary.



Easily cut with ordinary tools. Kaylo is light-weight and so workable that it can be removed and replaced for line inspections without waste.

Tested in thousands of industrial applications, Kaylo has flexural strength, compressive strength and resistance to abrasion far above normal requirements for heat insulation. It is a flawless performer at all temperatures up to 1200°F... through the hot water and low-pressure steam ranges and through the super-heated steam range. Its low coefficient of conductivity is the result of the smallness and number of its insulating air spaces, which present a material internal surface of approximately 100 acres per cubic foot.

Kaylo is made both as block and as molded pipe insulation with the widest range of sizes, forms and thicknesses of any high temperature insulation. Now distributed by Owens-Corning Fiberglas Corporation, it provides, together with Fiberglas* Industrial Insulations, the most complete and versatile line of plant insulations available. For complete technical data, see our listings in Sweet's File, Chemical Engineering Catalog, or Refinery Catalog, or write: Owens-Corning Fiberglas Corporation, Dept. 97-B, Toledo 1, Ohio.

Kaylo and Fiberglas* now provide you with all-purpose industrial insulations from one reliable supplier.



*T. M. Reg. Owens-Corning Fiberglas Corporation

NEW!

ASHCROFT

2½" GAUGE



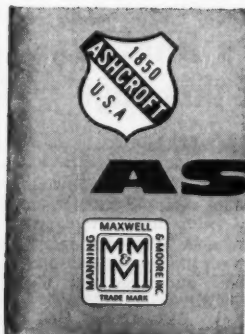
**HAS TYPE 316
STAINLESS STEEL SYSTEM
TO WITHSTAND
CORROSIVE CONDITIONS**

High resistance to corrosion and sustained high accuracy are combined in this new heavy-duty Ashcroft Gauge. The 2½" dial size makes this compact instrument ideal for small tanks and processing equipment where large pressure gauges would be impractical. Bourdon tube (welded at socket and tip) . . . square shank and ¼" male N.P.T. bottom connection . . . geared movement—the entire gauge system is Type 316 stainless steel.

Made in standard graduations from 30 psi through 1,000 psi, this new Ashcroft Pressure Gauge has a black dial with easy-to-read white figures. The drawn steel case and threaded ring are finished in black. Pointer is precision needle type. Every part is designed, tested and manufactured to meet rigid service conditions.

YOUR INDUSTRIAL SUPPLY DISTRIBUTOR now has this new Ashcroft Gauge in stock. Let him know your requirements. You can depend on him for experienced counsel and prompt delivery.

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

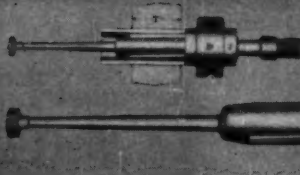


ASHCROFT GAUGES

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT
MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, Stratford, Conn. 'HANCOCK' VALVES, Watertown, Mass. 'CONSOLIDATED' SAFETY RELIEF VALVES, Tulsa, Oklahoma. AIRCRAFT CONTROL PRODUCTS, Danbury & Stratford, Conn. and Inglewood, Calif. "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, Muskegon, Mich.



WIEDEKE Precision-Built Tube Expanders



No. 255 for average Sheets

Ball Bearing Adjustable Thrust Collar Tube Expanders are made for Tubes $\frac{1}{4}$ " diameter and larger. Recommended for use with any Controlled Rolling Motor for uniform expansion of Tubes.

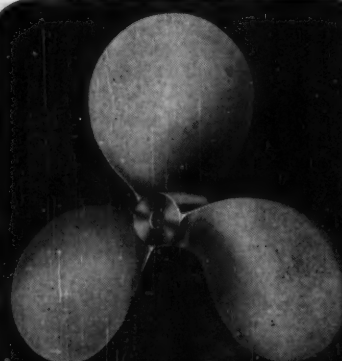
See your Dealer or write us for Bulletin.

For Rolling—Heat Exchanger, Condenser and other Heat-Transfer Tubes.



No. 270—For thick or multiple Sheets.

THE GUSTAV **WIEDEKE** COMPANY
DAYTON 1, OHIO



industrial propellers

for { MIXING
PUMPING
AREATING
AGITATING

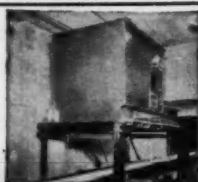
Send for free Technical Bulletin IP

Columbian
BRONZE CORP.
Freeport, L. I., N. Y.

Standard for Half a Century

WHERE TO BUY

Featuring additional Equipment Materials, Supplies and Service for the Process Industries



WEIGH MATERIALS WHILE CONVEYING

with the
MERRICK WEIGHTOMETER

MERRICK SCALE MFG. CO.
171 SUMMER ST., PASSAIC, N. J.

CHEMSTEEL CONSTRUCTION COMPANY, INC.

501 Chemsteel Bldg., Walnut St., Pittsburgh 32, Pa.

Send data on Engineering & Construction facilities for
ACID-ALKALI-PROOF CONSTRUCTION
of processing & storage tanks & flooring.

NAME

COMPANY

ADDRESS

CITY ZONE STATE

5 CORROSION CONTROL SERVICES ..

You'll Find Metalweld Services A Sound Investment, Not An Expense!

1. **SYNTHETIC RESIN COATINGS** — Application of Vinyl, Epon, Baked Phenolic, Neoprene, Thiokol Coatings in the MW Plant and in the field. RR siding for lining tank cars.
2. **RUBBER LININGS** — Rubber and Koroseal Sheet Linings applied to tanks, pipe, process equipment, etc.
3. **METALLIZING** — Sprayed Zinc and Aluminum for Corrosion Protection. Metal Spraying to build up parts, rolls, shafts, journals, etc.
4. **MW PLASTICOTE LINING** — Applied to hot water tank interiors — eliminates rust — passes inspection.
5. **SURFACE CLEANING** — Sand and Steel Grit Blasting in the large MW blastrooms or in the field.

CONSULT BEFORE YOU SPECIFY
Send Us Facts or Ask for Literature!

PROTECTIVE COATINGS DIVISION



METALWELD, INC.

Scotts Lane & Cresson Ave.
Phila. 29, Pa. • Victor 8-1810

TANK-METER  **ANY LIQUID**
FOR MEASURING TANK
CONTENTS ANY DISTANCE AWAY
Uehling
INSTRUMENT CO.
491 GETTY AVENUE, PATERSON, N. J.
SEND FOR BULLETIN 945

Crush DRY ICE

Takes 50 lb. Cake. Gives Crushed
Sizes: Powder, $\frac{1}{2}$ ", 1", 2".

FRANKLIN P. MILLER & SON, Inc.
36 Meadow St., East Orange 11, N. J.

SUPREME CRUSHERS

**Make it a HABIT . . .
to check this page
—EACH ISSUE**

This WHERE TO BUY Section supplements other advertising in this issue with these additional announcements of products and services essential to efficient and economical operation in the process industries.

PROFESSIONAL SERVICES

**PROCESS DEVELOPMENT & PILOT PLANT WORK
PLANT CONSTRUCTION & ERECTION
PROCESS & PLANT DESIGN
EVALUATION AND APPRAISAL
EQUIPMENT DESIGN**

**CHEMICAL & BACTERIOLOGICAL ANALYSIS
SYSTEMS ENGINEERING
INSTRUMENTATION
CATALYST DEVELOPMENT
TRANSLATIONS**

**PATENTS
PLANT SITE SELECTION
MANAGEMENT
GENERAL CONSULTING**

R. S. ARIES & ASSOCIATES
Consultants to the Chemical Industries
New Products and Processes
Design & Initial Operation of Complete Plants
Process Analysis — Market Research
COMPLETE TECHNICAL & ECONOMIC SERVICES
270 Park Ave. EL 5-1439 New York 17, N. Y.

**When you need
a SPECIALIST
in a hurry . . .**

JAMES P. O'DONNELL
Engineer
**CHEMICAL AND PETROLEUM PROCESS
PLANTS**
Design—Procurement—Construction Supervision
Start-Up
New York, N. Y. Beaumont, Texas

W. L. BADGER
309 South State Street Ann Arbor, Mich.
CONSULTING CHEMICAL ENGINEER
Evaporation, crystallization, and Heat Transfer;
Complete plants for salt and caustic soda; Complete
Dowtherm installations.

Chemical Engineering's Professional
Service Section offers the quickest,
most direct method of contracting
consultants who may be available
NOW.

**PATCHEN AND ZIMMERMAN
ENGINEERS**

Chemical, Process, and Industrial Plants
Investigations—Reports—Design—Supervision
Augusta, Ga. Atlanta, Ga. Anniston, Ala.

BROWN, BLAUVELT & LEONARD
Chemical & Industrial Engineers
"Dependable Engineering For Profitable
Operations"
470 Fourth Avenue
New York 16, N. Y.
MU. 6-4712

THE KULJIAN CORPORATION
Consultants • Engineers • Constructors
Chemical • Industrial • Process
1200 N. Broad St. Phila. 21, Pa.
Offices Throughout the World

PILOT ENGINEERING COMPANY
RESEARCH & DEVELOPMENT
From idea through pilot plant
DESIGN Process—Equipment—Complete plants
PRODUCTION Supervision—Trouble shooting
Improvements—By-product recovery
P.O. Box 8837 Washington 11, D. C. JUniper 8-9148

CARL DEMRICK
Technical Translations
Send for Circular
58 So. Broadway Yonkers, N. Y.

**R. B. MACMULLIN
ASSOCIATES**
Chemical and Electrochemical Plants
Complete Process and Project Engineering
Research Guidance Economic Surveys
610 Hancock Bldg. Niagara Falls, N. Y.

SANDERSON & PORTER
Engineers and Constructors
Reports and Surveys
New York, New York

HALE AND KULLGREN, INC.
*Specialists in Process and Plants for Rubber
and Plastics*
A Complete Engineering Service
Including: Economic Surveys; Process Design;
Installation; Contracting and Operation
613 E. Tallmadge Ave. Akron 10, Ohio

CHAS. T. MAIN, INC.
Engineers
Industrial Plants
Reports Design Supervision
80 Federal Street Boston 10, Mass.
317 So. Tryon Street Charlotte, North Carolina

J. E. SIRRINE COMPANY
Engineers
Plant Design & Surveys covering Chemicals, Elec-
trochemical and Metallurgical Production; Trade
Waste Disposal; Water Supply & Treatment;
Analyses & Reports.
Greenville - - - - - South Carolina

KNOWLES ASSOCIATES
*Chemical—Metallurgical—Mechanical
Engineers*
Consultation — Design
Complete Plants — Equipment
Heavy Chemicals — Ore Dressing
19 Rector Street New York 6, New York
Bowling Green 9-3456

C. L. MANTELL
Consulting Chemical Engineer
Process Research and Engineering
Development
457 Washington Street New York 13, N. Y.

MARCUS SITTENFIELD
Consulting Chemical Engineer
Plants - DESIGN - EQUIPMENT
Economic - SURVEYS - Technical
Process DEVELOPMENT - Product
Registered Professional Engineer
1411 Walnut St. Philadelphia 2, Pa.

KOHN & PECHENICK
Consulting Chemical Engineers
Plants — Process — Equipment
DESIGN
Reports Trouble-Shooting Appraisals
262 Huron St. Brooklyn 22, N. Y.

METCALF & EDDY
Engineers
Industrial Waste Treatment
Water Supply and Water Purification
Stream Pollution Investigations
Laboratory
Statler Bldg. Boston 16

**THE J. G. WHITE
ENGINEERING CORPORATION**
Design - Construction - Reports - Appraisals
80 Broad Street, New York 4

Knowledge plus Experience . . . always a vital asset—

**When you are in need of expert advice to be applied to solving your particular problems, save
TIME and COST by calling in a specialist.**

These consultants have broad experience in management services that can be invaluable to you.

CLASSIFIED

SEARCHLIGHT SECTION

ADVERTISING

EMPLOYMENT • BUSINESS •

OPPORTUNITIES •

EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

\$1.50 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.

POSITION WANTED undisplayed advertising rate is one-half of above rate, payable in advance.

PROPOSALS, \$1.50 a line an insertion.

INFORMATION

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

DISPLAYED RATE:

The advertising rate is \$14.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. **AN ADVERTISING INCH** is measured $\frac{3}{8}$ inch vertically on one column, 3 columns—30 inches—to a page. C. E.

Send **NEW ADVERTISEMENTS** to N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y., for March issue closing February 4th

DESIGN AND DEVELOPMENT ENGINEER

Design and Development Engineer with experience in air and dust handling systems and the design of industrial dust and fume control and collecting equipment. Position requires the initiative, technical ability and experience to develop, design and test practical, marketable equipment from your own ideas and those of others. Must have successful record in designing industrial equipment. Replies treated in confidence and neither employer nor references communicated with until we have your written permission. Unusual opportunity for capable, progressive engineer interested in good future with prominent organization in growing field. To have consideration give complete outline of experience, age, education, reference, present compensation, salary expected to start.

REPLY

**Pangborn Corporation,
Hagerstown, Maryland**
Attention Mr. W. O. Vedder

**PILOT PLANT DIRECTOR
N.Y. Metropolitan Area**

Graduate Chemical Engineer. Experience with isocyanate foamed plastics. Experience with development, supervision of pilot plant operations and resin production. Familiarity with machine shop practices, mold design and molding practices. Ability to analyze and solve basic product application problems and reading engineering drawings essential. Some knowledge of polymeric chemistry. Submit resume and salary requirement.

P-5154, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

CHEMICAL ENGINEER

With good background in chemical technology wanted by progressive equipment designing and manufacturing company in Western Pennsylvania. Please submit record of education, experience, references and salary expected.

P-4911, Chemical Engineering
330 W. 42nd St., New York 36, N. Y.

CHEMICAL ENGINEERS

An active, confidential service! Interview at your convenience.
Call, write or wire

**GLADYS HUNTING (Consultant)
DRAKE PERSONNEL, INC.**
7 W. Madison St. Chicago 2, Ill.

CHEMICAL ENGINEER

Chemical Engineer experienced in resistance films and resistor materials needed for printed circuit research and development program in the Research Department of an Ohio manufacturer of electronic equipment.

Man accepted will be responsible for this phase of work and will report directly to the department head.

Salary open. Replies held in confidence. Allowance for moving expense.

Submit resume to

P-4811, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

POSITION OPEN Graduate Chemical Engineer, under 50 years of age having minimum of 15 years industrial chemical experience. Position entails general plant management; wide range of chemical engineering including operation and maintenance of sugar processing equipment and chemical controls. Large American-owned sugar company operating in Cuba. Good quarters furnished by company. Salary not subject to U. S. income taxes under present laws. Reply giving complete details, stating age, marital and military status, experience, technical training and salary requirements. Reply will be held confidential. Address: P-5036, Chemical Engineering.

EMPLOYMENT SERVICES

SALARIED POSITIONS \$5,000 to \$35,000. We offer the original personal employment service (established 45 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars, R. W. Blxby, Inc., 653 Brisbane Bldg., Buffalo 3, N. Y.

POSITIONS WANTED

CHEM. ENGR.—B.S.—M.S. credits—six years widely diversified experience—interested in development, development engr.—desire northeastern location. PW-5072, Chemical Engineering.

MECHANICAL ENGINEER college graduate, age 39, 18 years experience in Supervision, operations, and maintenance of power generating plants. Presently employed as chief engineer of steam-electric generating plant. Valid reasons for desiring relocation. Excellent references including that of present employer. PW-5102, Chemical Engineering.

SELLING OPPORTUNITY WANTED

SALES ENGINEERING Organization with wide experience & contacts, wishes to represent manufacturer of Heat Exchangers & Allied Chemical Process Equipment on an exclusive basis in the Met. New York North, N. J. and S. W. Conn. territory. RA-4272, Chemical Engineering.

WANTED

ANYTHING within reason that is wanted in the field served by Chemical Engineering can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

EXCLUSIVE TERRITORIES AVAILABLE

For firms or individuals to sell and service leading manufacturers complete line of

Corrosion Proof Materials and Construction

On Commission Basis. Locations Available: Alabama, Carolinas, Georgia, Kentucky, Minnesota, Missouri, Virginia, Washington State.

RW-4227, Chemical Engineering
520 N. Michigan Ave. Chicago 11, Ill.

CUSTOM REFINING FACILITIES . . .**AVAILABLE**

- Complete Distillation Service • Distillations
- Extractions • Fractionations
- Drum Lots—Tank Cars
- All Types of Crude Mixtures
- By-Products, Residues, Wastes
- Contaminated Solvents

WANTED

Truland CHEMICAL & ENGINEERING CO., Inc.
Box 426, Union, N. J. Murdock 6-5252

An Investment !

Productive advertising is an **INVESTMENT** rather than an **EXPENDITURE**.

"Searchlight" advertisers almost invariably report prompt and satisfactory results.

BE CONVINCED — send us your advertisement **TODAY**.

Address
Classified Advertising Division

CHEMICAL ENGINEERING

330 WEST 42nd STREET
NEW YORK 36, NEW YORK

Consolidated Services and Equipment

SAVE "DOWN TIME" AND \$\$\$ WITH THESE
MAINTENANCE SERVICES

METAL SPRAYING

Worn mechanical parts restored. Equipment and parts increased in thickness or diameter. Surface defects corrected. Surfaces made more resistant to wear or corrosion. Any metal obtainable in wire form can be sprayed on any other metal or on other base materials, such as wood, brick, leather, stone, plaster fabric.



• Check this complete range of Services •

RETUBING—Fast retubing and repairs on all tubular equipment. Largest, best equipped shops in the country.

METAL SPRAYING—Worn mechanical parts restored. Thickness and diameters increased. Defects corrected. Any metal in wire from applicable to any other metal or surface.

STEAM ENGINE & PUMP REPAIRS—Complete maintenance service, from analysis of needs to rebuilding, on American Ball Engines, Harrisburg Engines, Blake Pumps.

INSTRUMENT REPAIRS on all types of electrical indicating, recording instruments, pyrometers, gages, etc. Regardless of manufacture. We also manufacture:

SPECIALTIES to make your power plant run smoother. Coils, cleaning guns, plugs, condenser ferrules, fibre plugs, flowrite heat exchanger tubes, etc. etc.

REDESIGNING AND REBUILDING—Used equipment restored through simple repair or redesign and complete rebuilding. Emergency service. Maintenance and spare parts service, day, night, Sundays, holidays.

24-HOUR SERVICE

EVERY DAY

SUNDAYS, HOLIDAYS

"Consolidated" gives you the facilities of the country's largest rebuilding shop for ASME-U69 code work. We recondition thoroughly and promptly **HEAVY PROCESSING EQUIPMENT**. We also repair and build Pressure Vessels, Jacketed Kettles, Vulcanizers meeting code requirements.

TUBULAR EQUIPMENT

We have on hand one of the largest stocks of tube sheets, cupro nickel, admiralty and aluminum tubes, plain and finned, enabling us to give you immediate service. Repairs may be done in our shops or our crews will visit your plant for retubing and repair of Heat Exchangers, Condensers and other types of tubular equipment.

NEW EQUIPMENT

We also manufacture **CONDENSERS, HEAT EXCHANGERS, PRESSURE VESSELS, ROTARY KILNS, DRYERS AND COOLERS, ROTARY MIXERS AND BLENDERS**. Ask us to quote on your requirements.

EXPERIENCE

Our 38 years of experience in rebuilding and furnishing a broad line of **EQUIPMENT** to the **PROCESS INDUSTRIES** is your best assurance of satisfaction. No matter how urgent your requirements, we are ready to serve you.

For Prompt Service phone, wire or write
MAINTENANCE DIVISION

MEMO Sell your idle machine—or entire plant quickly and confidentially. Send list today.

BEST BUYS

3—#12 Sweetland S.S. Filters.

1—Buffonac 48" x 40" Drum Flaker, Chrome plated, S.S. ends.

16—Sperry 18" x 18" iron recessed Filter Presses, 12 Chambers.

1—Fitzpatrick Stainless Comminutor Model D. Reversible, M.D.

1—American 24 x 36 Dbl. Drum Dryer, Complete.

1—Read Standard horiz., dbl. ribbon Mixer, center disch. 8' x 36" x 42", 2,000#, 480 gal., practically new.

1—Day #30 Imperial dbl. sigma blade, Jack. Mixer, 75 gal.

3—Colton 5½ single punch Tablet Machines, M.D.

3—3' x 50' Rotary D. H. Dryers or Coolers.

2—Link-Belt Co. S/S 5'2" x 16", No. 502-16 Roto Louvre Dryer.

2—CME Cont. S/S Centrifugal. Solid bowl, 21" & 30" x 40".



CONSOLIDATED

Our 38th Year
PRODUCTS CO. INC.

**DAY, NIGHT AND
HOLIDAY SERVICE**
N.Y. TEL. BArcloy 7-0600

ON OBSERVER HIGHWAY, HOBOKEN, N. J. Tel.: HObocken 3-4425

Cable Address:
"Equipment" Hoboken, N. J.

WANTED BY A LARGE ENGINEERING COMPANY FOR ERECTION AND EXPANSION OF A CHEMICAL PLANT

Will give consideration to all offerings of equipment listed below and adapt available items to our needs since plans are flexible:

Stainless Steel Reaction Kettles & Stills (up to 1750 gallons).

Stainless steel Tanks (up to 8500 gals).

Filters—Pressure types, Rotary types, Plate types.

Mixers—heavy duty Baker Perkins type and Dry Mixers.

Tablet and Preform Pressing machines.

Screens—Rotex type.

Centrifuges—Basket and Bowl types.

Dryers—Shelf Atmospheric and Vacuum type, Rotary Vacuum, Rotary Flaker and Double Drum Rotary.

Grinding and Pulverizing machines including Roller Mills of high-speed type, Micro and Fitzpatrick Comminutors, Pebble and Rotary Ball Mills.

Raymond and Williams type Roller Mills.

Vacuum Fans and Evaporators.

Autoclaves.

Kilns and Coolers.

Fractionating Columns.

Address: Box 1351; Church Street Station, New York 8, N. Y.

\$6,000,000 LIQUIDATION

CHEMICAL PLANT BATON ROUGE, LA.

INSTALLED 1953—OPERATED LESS THAN 30 DAYS

WIDEST VARIETY OF QUALITY EQUIPMENT EVER OFFERED!

KETTLES—REACTORS

EVAPORATORS

- 1—Leader Iron Wks. 1800 gal. 316 SS jacketed, agitated Reactor 25# int. pressure 75# jacket pressure.
- 1—Leader Iron Wks. 1000 gal. 316 SS jacketed, agitated Reactor 6' x 56", 75# jacket pressure, 25# int. pressure.
- 6—Pfaudler 1000 gal. glass lined jacketed, agitated Reactors 75# int. pressure 90# jacket pressure, equipped with Hastelloy "C" turbine agitator and baffles.
- 1—750 gal. 316 SS jacketed, agitated Kettle.
- 1—300 gal. 316 SS clad jacketed Kettle 90# int. pressure.
- 3—Evaporator Bodies 4'x13', 316 SS clad with 109—3"ODx6', 316 SS tubes, 500 sq. ft. per body with condenser, piping, etc.

HEAT EXCHANGERS

- 3—Alberger 600 sq. ft. Karbate, 40# shell, 40# tubes.
- 1—Struthers-Wells 461 sq. ft. Karbate, 40# shell, 40# tubes.
- 1—Struthers-Wells 431 sq. ft. Karbate, 60# shell, 60# tubes.
- 1—400 sq. ft., steel.
- 3—Pfaudler 390 sq. ft., 316 SS, 75# shell, 75# tubes.
- 2—Struthers-Wells 370 sq. ft. Karbate, 52# shell, 60# tubes.
- 1—Struthers-Wells 370 sq. ft. Karbate, 40# shell, 40# tubes.
- 1—Struthers-Wells 330 sq. ft. Karbate, 60# shell, 60# tubes.
- 1—Alberger 255 sq. ft. Karbate, 40# shell, 40# tubes.
- 1—Alberger 159 sq. ft. Karbate, 40# shell, 40# tubes.
- 2—Nickel 93.8 sq. ft. double pipe, 300# shell, 100# tubes.
- 2—Alberger 88 sq. ft. Karbate, 40# shell, 40# tubes.
- 1—Struthers-Wells 83 sq. ft. Karbate, 60# shell, 60# tubes.
- 7—Alberger 70 sq. ft. Karbate, 40# shell, 40# tubes.
- 1—Struthers-Wells 31 sq. ft. steel, 75# shell, 75# tubes.
- 4—Alberger 16.4 sq. ft. Karbate, 40# shell, 40# tubes.
- 1—National Carbon 16 sq. ft. Karbate, 40# shell, 40# tubes.

- 7—Sharples C-27 Super-D-Hydrators, 316 SS, Totally enclosed.
- 1—Ingersoll-Rand Jet Refrigeration unit, 208 ton, at 60 deg. F.
- 1—Ingersoll-Rand Jet Refrigeration unit, 136 ton at 45 deg. F.
- 1—Kemp Inert Gas Producer 10,000 SCFH, Model 10-MID complete with Model JC-SE2 dual tower absorptive dryer and Fuller Inert Gas Compressor, Type C-40 with 25 HP motor.
- 2—Illinois Water Neutralizers 5' x 9', 316 SS, each with 91 cu. ft. Duolite A7 Resin.
- 1—Foster Wheeler 2.7 million BTU Dowtherm Unit, 150# Design Pressure, 866 sq. ft. heating surface, gas heated.
- 3—Patterson 7'6", 6' & 5' dia. Rubber lined Conical Blenders Type B. Xp motors.

PUMPS

- 13—Karbate Centrifugal
 - 2—40 gpm 120' head
 - 2—50 gpm 24' head
 - 9—60 gpm 60' head
- 8—Duriron Co. Chlorimet-3 Centrifugal
 - 2—45 gpm 84' head
 - 2—60 gpm 180' head
 - 4—60 gpm 240' head
- 7—Duriron Co. Durimet Centrifugal
 - 1—20 gpm 22' head
 - 3—60 gpm 180' head
 - 3—150 gpm 52' head
- 13—Duriron Co. 316 SS Centrifugal
 - 4—60 gpm 47' head
 - 4—70 gpm 80' head
 - 1—80 gpm 125' head
 - 3—165 gpm 145' head
 - 1—175 gpm 160' head
- 7—Lawrence 316 SS Centrifugal
 - 2—10 gpm 27' head
 - 1—60 gpm 208' head
 - 1—70 gpm 157' head
 - 2—100 gpm 25' head
 - 1—350 gpm 123' head
- 2—Gould 304 SS Centrifugal, motor driven 98 gpm 70' head
- 2—LaBour steel Centrifugal
 - 1—50 gpm 85' head
 - 1—70 gpm 90' head
- 7—Ingersoll-Rand steel Centrifugal
 - 2—650 gpm 116' head
 - 1—1000 gpm 93' head
 - 2—1000 gpm 100' head
 - 2—1000 gpm 110' head
- 1—Deane steel Centrifugal, motor driven 250 gpm 70' head
(All driven with explosion proof motors)

TANKS

- 4—Pfaudler 5000 gal. glass lined 9' dia. x 9'6" long, 35# int. pressure.
- 2—Pfaudler 2300 gal. glass lined 78" dia. x 96", 50# int. pressure.
- 5—Pfaudler 1200 gal. glass lined 66" dia. x 72" high, 50# int. pressure.
- 1—Pfaudler 500 gal. glass lined 4' dia. x 5', 40# int. pressure.
- 1—316 SS, 13,000 gal. Hopper 18' dia. x 4'4" on the straight side with a 9' cone and 5 HP Lightnin agitator.
- 1—316 SS. 7500 gal. Hopper 12' x 6' with 5'6" cone.
- 2—316 SS Horizontal 5,000 gal. 6'6" dia. x 20' long, 25# int. pressure.
- 1—Steel 30' dia. x 33'2" high, 175,000 gal. cap.
- 3—Steel Horizontal 24,000 gal. 10' dia. x 40' long, 50# int. pressure.
- 1—Steel Horizontal 8' dia. x 30' long, 10,000 gal.
- 3—Steel 8' dia. x 27'3" long, 9000 gal. cap., 25# internal pressure.
- 1—Steel Horizontal 5' dia. x 22' long, 3250 gal., 125# internal pressure.

DRYERS

- 2—Western Precipitation 304 SS jacketed heated "Holo-flite" Screw Conveyor Dryers 50 ft.
- 1—Rietz Mfg. Co. 304 SS jacketed heated Screw Conveyor Dryer 50 ft.
- 2—Bullovak 6' dia. x 5'6" Monel, single drum Flakers or Dryers.
- 1—Allis Chalmers 5'6" dia. x 25' long Rotary Dryer 1/2" shell.

CONVEYORS

- 4—Link Belt Rubber Belt Conveyors fully enclosed 12"x30', 12"x34', 12"x55', 12"x77' long.
- 2—Link Belt Twin Screw Conveyors, 3/16 SS. 18"x10', 18"x72'.
- 1—Link Belt Twin Screw Conveyor, steel 11"x14', 11"x10'.
- 1—Link Belt Screw Conveyor 6"x12', 304 SS.
- 1—Link Belt 40'6" c.c. Bucket Elevator buckets and housing of 304 SS.

BLOWERS

- 3—Sturtevant spark proof Blowers 9500, 11,000 and 17,500 cfm.
- 3—American Blowers 7900 and 12,000 cfm motor driven.
- 1—Buffalo-Forge 640 cfm 7" static pres.
(All driven with explosion proof motors)

Stainless Steel and Karbate piping, Stainless Steel and Karbate Valves, instruments, steel buildings, etc.

Details on request

TEXAS OFFICE—4101 San Jacinto St., Houston 4, Texas—Tel.: Locust 1351

Your inspection invited



BRILL

EQUIPMENT COMPANY

2401 THIRD AVENUE, NEW YORK 51, N. Y.

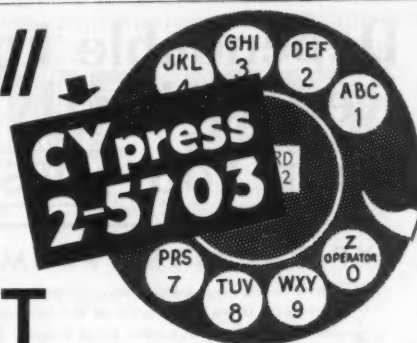
Telephone: CYpress 2-5703 • Cable: Bristen, N. Y.

A SINGLE ITEM
OR A
COMPLETE PLANT

Write, wire or phone us for complete information — Send us your surplus equipment lists today

Make this call get "on the ball" with BRILL EQUIPMENT

IN STOCK AND AT OTHER LOCATIONS



DRYERS—KILNS

- 1—Vulcan 7'x120' 5/8" shell.
- 1—Vulcan 8'125' 3/4" shell.
- 2—Allis Chalmers 8'x80' 5/8" shell.
- 3—Cummer 5'x40', 5'x30'.
- 1—Vulcan 4 1/2'x50' Rotary Dryer.
- 3—Link Belt, Hersey Rotary Dryers, S.S., 7'5" x 20', 4'x30', 3'x20'.
- 1—Louisville 6'x80' Rotary steam tube Dryer welded shell 125# pressure.
- 1—Devine #27 double door Vacuum Shelf Dryer with 17—59"x78" shelves.
- 1—Stokes Vacuum Shelf Dryer #138—H-10 44"x40" shelves.
- 2—Struthers Wells 5'x15' nickel clad Rotary Vacuum Dryers.
- 1—Devine 5'x10' steel Rotating Vacuum Dryers.
- 1—Stokes 30"x8', 3'x15' Rotary Vac.
- 4—Bullovak Double Drum 32" x 100", 36"x84", 32"x72", 32"x52".
- 1—Devine 2'x4' Vacuum Drum Dryer 316 S.S.
- 2—Bullovak 6' dia. Crystallizers.
- 1—Bullovak 6'6" dia. Vac. Crystallizer S.S.

FILTERS

- 3—Oliver Monel 8'x10', 3'x2' Rotary Vacs.
- 1—Oliver S.S. 8'x8' Rotary Vac.
- 1—Feine 4'x4' Rotary Vac. string discharge 316 S.S.
- 2—Elanco 8'x8' Rotary Vacs.
- 8—Oliver Rotary Vacuum 11'6"x18', 11'6"x14', 8'x12', 8'x10', 8'x8', 8'x6', 3'x1'.
- 1—Swenson 4'x2' nickel Rotary Vac.
- 2—Sweetland #12 with 72 and 36 leaves.
- 1—Sweetland #5 with 15 S.S. leaves.
- 2—Sweetland #3 all stainless, 12 leaves.
- 1—Niagara type Horizontal Filter 375 sq. ft. S.S. jacketed.
- 1—Niagara #140-36 all 316 S.S.
- 1—Niagara #110-20 with 12 S.S. leaves.
- 1—Sparkler #33-S-17, steel.
- 1—Shriver 36" P&F 42 chambers.
- 4—Shriver 30" P&F 30 chambers.
- 8—Sperry 24" P&F 16 chambers.
- 2—Sperry Aluminum 30" and 24" P&F.
- 1—Sperry 36" P&F eye, heresite coated.
- 12—Filter Press Skeletons, all sizes.

CENTRIFUGALS

- 1—Bird 40" Suspended 347 S.S.
- 1—Bird 46" Suspended, rubber covered.
- 2—Tolhurst 40" Suspended, steel.
- 1—AT&M 36" center slung, rubber covered.
- 1—Fletcher 30" Suspended, steel.
- 1—Tolhurst 28" Suspended, steel.
- 2—Tolhurst 30" center slung, steel.
- 2—Bird 18"x28" Continuous 310 S.S.
- 2—Sharples C-27, C-20 stainless steels Super-D Hydrators.
- 2—Sharples #16P Monel and S.S. Super Centrifuges.

PULVERIZERS—CRUSHERS

- 1—Devine 5'x10' steel, jacketed Mill.
- 2—Raymond 3 and 5 Roll High Side Mills.
- 4—Hardinge Mills 4 1/2'x18", 5'x22", 5'x36", 6'x22", 10'x48".
- 4—Patterson 6'x8', 5'x6', 4'x5', 3'x4', brick-lined Pebble Mills.
- 1—Patterson 6'x8' porcelain (Beryllite) Pebble Mill, 50 HP, NEW.
- 1—Patterson 4'x4' porcelain lined, jacketed Pebble Mill.
- 1—Abbe "Eureka" #3 porcelain Jar Mill 14.7 gallons.
- 1—National 10"x20" two-roll Mill, 25 HP motor.
- 2—Premier Colloid Mills 8" dia., S.S.
- 1—Jeffrey 30"x24" Hammer Mills, Type A.
- 4—Raymond, Gayco Separators 12', 8', 6', 4'.
- 1—Rietz 12" Disintegrator with 20 HP motor.
- 4—Mikro Pulverizers, #2TH, #1SH, #1SI and Bantam.

TEXAS LIQUIDATION TOWERS, COLUMNS AND EXCHANGERS

- 5—Columns S.S. 7'x25'6", 6'x64', 30"x25', 2'x34'.
- 1—Column nickel clad 5'x31'.
- 10—Columns steel 7'x5'x70", 7'6"x55'6", 7'x42', 6'x63', 5'x61'6", 4'x110', 4'x72', 3'6"x63', 2'6"x60', 2'x75'.
- 3—Heat Exchangers S.S. 920, 350 and 178 sq. ft.
- 2—Heat Exchangers steel, 1125 sq. ft., 850# PSIG, 900°F.
- 9—Kettle type Reboilers, steel and S.S. 1250, 1125, 750, 660, 440 and 340 sq. ft.
- 58—Atmospheric Heat Exchanger Units 304 S.S., 715, 477, 350 and 108 sq. ft.

MISCELLANEOUS

- Complete Oxygen Plant, 175 tons per day.
- 2—8'x10' S.S. Tanks, 120 PSI.
 - 1—11'6"x10' rubber lined Storage Tank.
 - 1—Gould 16" Centrifugal Pump 10,500 GPM at 135' head.
 - 4—IR 24" Centrifugal Pumps 8000 GPM Engine operated.
 - 3—In Propane Compressors steam driven 5410# per hr.
 - 2—Clark Bros. Gas Engines 4100 cfm., Model MA-4, 150 BHP.
 - 3—High Pressure Furnaces Natural gas fired, 2 1/2 to 15 million BTU per hr. Partial List Full Details on Request

SCREENS

- 1—Patterson single deck 40"x84" S.S.
- 1—#42 Rotex double deck 40"x84".
- 1—#11 Rotex single deck 20"x48".
- 1—#23 Rotex three deck 20"x80".
- 4—Tyler Hummer 4'x15', 4'x10', 4'x5' single deck with V-16 Vibrators.

MIXERS

- 2—Banbury #9, #3A.
- 1—Baker Perkins 100 gal. S.S. jacketed, Vacuum Mixer, 75 HP.
- 1—Baker Perkins 50 gallon, Sigma Blades, jacketed.
- 6—Sprout Waldron S.S. jacketed Powder Mixers 67, 27 and 10 cu. ft.
- 1—Struthers Wells 6'x9' S.S. jacketed, Rotary Mixer.
- 4—Baker Perkins 2 gallon, stainless steel.
- 1—Robinson 4000# steel powder.
- 6—Rodgers 400 to 3000# powder.
- 4—Simpson Intensive Mixers #0.
- 2—New Portable Agitators 1/4 to 5 HP.
- 4—Day, Ross 8 and 50 gallon, Pony.

KETTLES—STILLS— CONDENSERS—TANKS

- 2—Pfaudler 1000, 500 gal. glass lined, jacketed, agitated Reactors.
- 2—Blaw Knox 800 gal. S.S. agitated Reactors 100# int. press.
- 1—Struthers Wells 750 gallon, S.S. jacketed, agitated Reactor.
- 1—Bullovak double effect, Vertical S.S. Evaporator, 900 sq. ft.
- 6—Evaporators, single and multi-effect 300 to 14,000 sq. ft.
- 5—Foster-Wheeler Karbate Heat Exchangers 188 sq. ft., Unused.
- 9—Heat Exchangers, S.S. 50 to 100 sq. ft.
- 5—Bullovak Condensers 20 to 90 sq. ft.
- 1—Acme 150 gal., S.S., jacketed, agitated Kettle.
- 3—2300 and 1400 gal. Aluminum Tank.
- 6—Glass-lined Storage Tanks 6000 and 8000.
- 1—13,000 gallon Horizontal Pressure Tank ASME, 225# W.P.

MISCELLANEOUS

- 7—Stokes Vacuum Pumps 10 to 100 cfm.
- 4—Stokes DDS2, D2, D4, Dn, Rotary Tablet Machines.
- 1—Kux Rotary Tablet Press Model 15-25.
- 10—Nash Pumps TS12, TS8, H8, H7, L3 MD571, #4, #2.
- 2—Cumberland #20 Rotary cutters.
- 4—Olivite, Duriron rubber and stainless steel Centrifugal Pumps 1" to 6".

IF YOU DON'T SEE IT LISTED—ASK FOR IT—WE HAVE IT

TEXAS OFFICE—4101 San Jacinto St., Houston 4, Texas—Tel.: Locust 1351



BRILL

EQUIPMENT COMPANY
2401 THIRD AVENUE, NEW YORK 51, N. Y.
Telephone: CYpress 2-5703 • Cable: Bristen, N. Y.

A SINGLE ITEM
OR A
COMPLETE PLANT

Write, wire or phone us for complete information — Send us your surplus equipment lists today

Dependable Equipment Realistically Priced From Your **FIRST** Source



TYPICAL ITEMS FROM OUR INVENTORY

- ★ Oliver Horizontal Rotary Vacuum Filter; Pan 7' Dia.; Stainless Contacts, complete with Drive and Discharge Mechanism.
- ★ Shriver & Sperry Aluminum Filter Presses; 12", 18", 30", 36".
- ★ Shriver & Sperry Stainless Filter Presses; 12" and 18".
- ★ 2 Enzinger Pressure Filters; 15 leaves in tank 48" x 91".
- ★ A.T.&M. 30" S.S. Suspended Centrifuge, plow discharge; 20 HP.
- ★ A.T.&M. 42" Type 316 Stainless Suspended Centrifugal; 30/15 HP.
- ★ Sharples Super-D-Hydrators; Models C20 and C27 in Stainless.
- ★ Sharples Super-D-Canter Type 316 SS; Model PN 14.
- ★ DeLaval Nozzle Ejector Stainless Centrifuge or Yeast Separator.
- ★ Bird 36" x 50" Centrifugal Filter; Rubber Cov. & S.S.; 40 HP.
- ★ Bird 18" x 28" Continuous Steel Centrifuge with solid conical bowl.
- ★ Bird 40" x 60" Continuous Stainless Steel Centrifuge 50 H.P. plus accessories.
- ★ Horizontal Vulcanizer 6' x 10'; Simplex Door; ASME-U69; at 125# PSI.
- ★ Buflavak Stainless Clad Vac. Filter-Dryer; Jktd; 78" x 58" complete.
- ★ Stokes Rotary Jacketed Vacuum Dryer; 30" x 10' complete.
- ★ Devine Vacuum Shelf Dryer No. 12; shelves 40" x 42".
- ★ Squier Stainless Clad Rotary Atmospheric Dryer; 30" x 20".
- ★ Hersey S.S. Rotary Gas Fired Dryer; 5' x 26".
- ★ Bagley & Sewell Double Drum Dryer; 28" x 60" with Accessories.
- ★ C.E. Two Stage S.S. Flash Drying System; 1000 lbs. evap. per hour.
- ★ Raymond Flash Drying System including No. 47 Imp Mill, Dust Collector, Cyclone, Gas Fired Heater and accessories.
- ★ Louisville Steam Tube Dryer; 54" x 40' with Cooler 38" x 20'.
- ★ Rotary Jacketed Vacuum Dryer; 52" x 102"; Dust Collector and access.
- ★ Copper 2000 gal. Vacuum Pan; manhole type; coil heated.
- ★ Zaremba INCONEL Double Effect Evaporator; 60" x 17' and 84" x 15'6".
- ★ Swenson Quadruple Effect Evaporator; Long Tube Vert. Film Type.
- ★ Stainless Steel Bubble Cap Column; 16 sec.; 8 1/2" x 19'; complete.
- ★ Aluminum Column; Bubble Cap; 60 plates; 27 1/2" dia. x 36' high.
- ★ Pfaudler Glass Lined Jacketed Reactors; 150 gal., 400 gal., 1000 gal.
- ★ Monel 750 gal. Reactor; Jacketed and Agitated; 5' x 5'.
- ★ Lancaster Stainless Lined Rotary Reactor; 300 PSI; Int. 50" x 17'.
- ★ Dopp Cast Iron Jacketed and Agitated Kettles; 650 gal.; 61" x 68".
- ★ Bethlehem Cast Iron Sulphonator; 79" x 74 1/2"; with Coils in Jacket.
- ★ Orville Simpson Rotex Sifters; 30" x 60"; 60" x 84"; 40" x 120".
- ★ Robinson Unique Gyro Sifters; 20" x 69"; 20" x 86"; 40" x 60".
- ★ A. O. Smith; Type 405 Stainless Lined Pressure Tanks; 135 PSI; 10' x 30' 20,000 Gal.
- ★ Horizontal Lithcote lined Tank; 3500 gal. 6' x 17'.
- ★ Stainless Steel 40 cu. ft. Double Ribbon Jacketed Mixer; 32" x 96".
- ★ Porter Type 316 S.S. 30 cu. ft. Ribbon Mixer.
- ★ Stainless Steel 63 cu. ft. Ribbon Mixer; 36" x 100".
- ★ Sprout Waldron 283 cu. ft. Steel Ribbon Mixer; 5' x 10'.
- ★ Readco 210 gal. Jacketed Heavy Duty Double Ribbon Mixer, 30" x 68".
- ★ Sprout Waldron Stainless Ribbon Mixer; Continuous Cylinder; 28" x 12'.
- ★ W. & P. Type Heavy Duty Double Arm Jktd. Mixer; 100 gal. working.
- ★ Baker Perkins 200 gal. Jacketed Double Arm Mixer; size 17; BB/V11.
- ★ Stainless Tumbling Barrel Mixer 5' x 5'; baffled interior; 3 H.P.
- ★ Lancaster Mix Mullers; Type EAG3 and EAG4 with accessories.
- ★ Colton Model #5 1/2 Single Punch Tablet Press; 3" x 1 1/2" die; 5 HP.
- ★ Ross Stainless Steel Heat Exchanger; 1100 sq. ft. surface area with 284 tubes.
- ★ American Ring Roll Pulverizer with 50 HP 3/60/220-440 V motor.
- ★ International Type X24 Pebble Mill 8' x 8' with 50 HP gearmotor.
- ★ Patterson Buhrstone Lined Pebble Mills; 5' x 8'; 6' x 6' and 6' x 8'.
- ★ Hardinge Conical Ball Mill 10' diameter x 48" face.

TRADE IN PLAN — RENTAL — PURCHASE PLAN

OVER 5000 UNITS IN STOCK

Send for LATEST BULLETIN for Complete STOCK LIST

FRED R. FIRSTENBERG, Pres.

FIRST MACHINERY CORP.

209-289 TENTH STREET, BROOKLYN 15, N. Y.
PARKING ON THE PREMISES Phone: Sterling 8-4672

EQUIPMENT

Latest type
Metallurgical
and Chemical
Equipment

EXCELLENT CONDITION

Hardinge Conical Ball Mill 10' x 48"
Oliver All Iron Rotary Vacuum Filters
Buflavak Twin Drum Dryer
Dorr Type A Thickeners
Allis-Chalmers type 222 Gyratory
Crusher
Link Belt Screw & Belt Conveyors
Norblis & Sly Dust Collectors
Dorr, Morris, Worthington process pumps
Research Corp. Electrostatic Precipitator

The above items include all auxiliary equipment with individual motor and control 220/440/3/60. The equipment may be inspected on foundations.

Complete List with Specifications Available.

**THE VULCAN
DETINNING CO.**
SEWAREN, N. J.

FEBRUARY SPECIALS

Day 5 Gal. SS Jktd. Mixer, sigma arms.
Mikro Pulverized, Bantam, #1-244.
Raymond #0000 Mill.
Sturtevant #00 Sledge Mill.
Gen. Amer. 42" x 120" Twin Drum Dryer.
Hersey 4' x 30" SS Rotary Dryer.
AT&M 300 gal. Rubber Churns.
Koch Electric Dryer, Y651.
56 cu. ft. SS Spiral Mixer, New, 7 1/2 HP mo.

NEW—Steel & S/S Mixers, Kettles, Tanks
Fabricated To Your Specifications
Engineering Advice Available

We Buy Complete Plants Or Single Units
What Have You For Sale Or Trade?

YOU CAN BANK ON

**EQUIPMENT
CLEARING HOUSE, INC.**
111 33rd STREET, BROOKLYN, N. Y.
South 8-4451—9264—8782

FEEDERS—Syntron F44 w/10" x 104" s/s trough & 40" x 48" apron w/3 HP variable drive
HARDINGE LAB GRINDING UNIT 24" mill, elec. ear, auto feed/cyclone/dust collector
HARDINGE MILLS—6' x 22" & 7' x 22" ball mill & 7' x 48" pebble
COMPRESSOR—Ing. Rand 20 cfm/5 HP & Gardner Denver 194 cfm—40 HP
MIXERS—W & P 50 gal double sigma-Lancaster EAG4 1/2—Simpson 24" & #1 1/2—Dry blenders 400/600#
SCREENS—Tyler hummer 3' x 5 single/triple—4 x 5 single, Robbins 4 x 12 triple deck
JAW CRUSHER—Champion #5—11 x 26
FORK LIFT—7500# Hyster—new engine—pneumatics
HAMMER MILLS—Wms. 8 x 14 & 24 x 30 (GA30)
ROTARY DRYERS—5 1/2' x 40'
SPENCER TURBO—1300 CFM 16 oz—10 HP motor
PEBBLE MILLS—24 x 36—25 x 23—60 x 48" all porcelain.

LAWLER COMPANY
Durham Avenue Metuchen, N. J.
Metuchen 6-0245

IT WILL PAY YOU TO INVESTIGATE OUR

LARGE STOCK

ANOTHER PERRY LIQUIDATION

JERSEY CITY, N. J.

- 4—7' Dia. x 60' L Rotary Kilns
- 1—5' D x 30' L Rotary Kiln
- 1—4'6" D x 40' L Rotary Dryer
- 1—4' D x 40' L Rotary Dryer
- 1—4' D x 24' L Rotary Dryer
- 1—4' D x 25' L Rotary Dryer
- 1—Hardinge Conical Steel Ball Mill, 8' D x 60"
- 1—Bird 24" Horiz. Centrifuge CH-208
- 1—Fletcher 40" Susp. Centrifuge, Steel, perf. basket, bot. disch.
- 1—Sweetland #10 Filter, 27 screens
- 1—Sweetland #7 Filter, 20 screens
- 1—Motor generator set, 31.5 KW Plating generator, 50 HP motor

FROM CLOSED PLANTS

- 1—Traylor Rotary Kiln 10'6" dia. x 105' long, welded
 - 1—Allis Chalmers 6' dia. x 16' long steel lined continuous Ball Mill
 - 3—Patterson & Abbe 4'6" dia. x 12' cont. Pebble Mills
 - 2—Charlotte Colloid Mills, model #50, 75 HP motor
 - 1—Bird solid bowl Centrifuge 36" x 50"
 - 4—Muffle Furnaces 24" dia. x 8'6" long rotary chrome nickel alloy tubes
 - 1—Jeffrey Pivoted Bucket Carrier, 185 ft., 16" x 18" piv. bkts.
 - 2—Rotex Screens, single deck, 40 x 96; 48 x 96
 - 2—4'6" x 40' Louisville Rot. Steam Tube Dryers
 - 2—42" x 120" Double Drum Dryers
 - 8—Centrifugal Pumps with 10 HP to 30 HP motors — 250 GPM to 800 GPM
 - 1—Nash Hytor Compressor with 20 HP motor
- Many Other Items — Tanks, Crushers, Blowers, Pumps, Screw Conveyors, Bucket Elevators, Trough Belt Conveyors, Apron Conveyors, Drag Conveyors; Dust Collectors, etc.

- 1—500 gal. St. St. Evaporator, 145 sq. ft. heating coil
- 1—2600 gal. T347 St. St. Jktd. Vacuum Kettle
- 1—Fitzpatrick Model F. Comminuting Mach, 25 HP
- 1—Conkey Triple Effect Evaporator, Herculoy, total 1900 sq. ft.
- 2—Blaw Knox 1/2 gal. St. St. Autoclaves, 2000# pr., Agit.
- 15—Distillation, Solvent Recovery, and Absorption Columns — 8" to 72" dia. — Aluminum, Copper, Steel, Stainless Steel
- 1—Sharples 16P St. St. Centrifuge
- 1—A.T.&M. 48" Susp. Centrifugal, Perf., St. St. Fume Tight
- 5—1200 sq. ft. Steel Shell & Tube Heat Exchangers—Unused
- 1—Stokes 3' dia. x 15' L Jacketed Rotary Vacuum Dryer
- 1—8800 gal. Vacuum or Pressure Cooker with agitator and vacuum pump, ASME 85#
- 6—Atm. Double Drum Dryers, 22" x 38", 24" x 60", 42" x 120"
- 6—Shriver 30" x 30" C.I. Filter Presses, open del 17 to 50 ch.
- 1—Sperry 15" aluminum P & F Filter, 29 ch.
- 2—W & P 100 gal. Sigma Blade Jktd. Mixer
- 1—Day 10 gal. St. St. Sigma Blade Jktd. Mixer
- 2—Pebble Mills 6' D x 8' L.
- 20—Aluminum Tanks — 500 to 3000 gal.
- 12 Copper Tanks, 1763 to 5500 gal.
- 30—Agitator Drives 3 to 40 HP
- 400' T316 St. St. Pipe 2 1/2"

HQ. FOR STAINLESS STEEL EQUIPMENT

USED EQUIPMENT IN STOCK

- 45—S.S. Storage Tanks from 15 gal. to 10,500 gal. sizes.
- 15—S.S. Pressure or Vacuum Tanks from 9 to 2600 gal. sizes.
- 20—S.S. Shell & Tube and coil type Condensers and Heat Exchangers from 14 to 785 sq. ft.
- 50—S.S. Jtd. open top Kettles from 35 gal. to 500 gal.
- 5—S.S. Jktd. agit. closed Reaction Kettles, 50, 100, 450, 500 gal.
- 10—S.S. Side Ent. Agitators 7 1/2 HP to 25 HP.

CONVERTING OR CHANGING EXISTING EQUIPMENT—
(Your own equipment or our stock)—Can be done in our own shops utilizing good used or surplus new materials.

FABRICATION—(IN OUR OWN SHOP)—Heliarc welding. Water-quenched stabilized welds. Large stock of type 304 and type 316 sheets and prefabricated tank sections and heads carried in stock assuring quick delivery of tanks.

Equipment
Bought & Sold
Plants
Liquidated



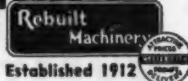
PERRY

EQUIPMENT CORP.

1413 N. 6TH ST., PHILADELPHIA 22, PA.

Phone
ST evenson 4-7210
Cable—PERI

Late-Type REBUILT EQUIPMENT At Bargain Prices—Immediate Deliveries

UNION


MIXERS

650 to 850 gal. Jacketed Mixing Tanks.
Day 35 to 75 gal. S. J. Imperial D. A. Mixers.

Day 650 gal. Jumbo S. J. Mixer.
Koven 2000 gal. Spiral Jacketed Mixer.
Stokes, Day, New Era, Hottman Mixers, from 2 to 450 gal., with and without Jackets, Single, Double Arm Agitators.
Baker Perkins, Day, Readco Heavy Duty 1/2 to 160 gals., Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.
Gemco 56 cu. ft. Double Cone Blender.
J. H. Day 50 gal. S. S. Jacketed Double Arm Mixer.
Day, Robinson, 15 to 10,000 lbs., Dry Powder Mixers.

LABELERS

Resina LC, Capem, Elgin Cappers.
Burt, Kyler Wraparound Labelers, to gal.

Pony M, MX, ML, World, Ermold, Pneumatic Semi Automatic and Automatic Labelers.

FILLERS

Pfaudler King C9, Horix S. S. Rotary Fillers.
S. & S. G1, HG88 Duplex Fillers.
MRM Semi Automatic Stainless Steel Vacuum Fillers.
Carter Vacuum Powder Filler.
Triangle Elec-Tri-Pak G2C, A3A Fillers.
Filler 1, 4-Head, Elgin 5-Head and Hope 6-Head Stainless Steel Piston Fillers.

PACKAGING

Standard Knapp 429 Carton Sealers.
Pneumatic Scale Cartoning Line.
Miller, Hayssen, Package Machinery, Oliver, Transwrap Wrappers.

TABLET MACHINES

Colton 2, 3 RP Rotary Tablet Machines.
Colton #5 1/2 Punch Tablet Machine.

GRINDING MILLS—SIFTERS

Mikro 4TH, 3W, 1SH and Bantam Pulverizers: Schutz O'Neill Mills.
Eppenbach V9 Aloxite Grinding Mill.
Rotex, Robinson, Tyler Hummer, Great Western, Gayco, Raymond Sifters.

MISCELLANEOUS

Oliver, Sweetland #2, Sparkler, Sperry, Shriver, Alsop Filters.

OVER 5,000 MACHINES IN STOCK—INSPECTION INVITED

Complete Details and Quotations Available on Request

UNION STANDARD EQUIPMENT CO.

318-322 Lafayette Street New York 12, N. Y.



More For Your Money

- * Bird cont. Centrifugal 40 x 60" S.S.
- * Shriver 36" P & F Filter, 20 chambers, wash
- * Sweetland #12 Filters, 36 & 48 lva, hydr case
- * Sweetland #5 Filter, 15 lva 4" centers
- * Elmco 8' x 8' Filter, rot cont grant new
- * Sperry 24" Filter, bronze 32 rec pits
- * Bird 40 Centrifugals perf basket, battery 2
- * Delaval Model ADVK 6 Centrifuge, 10 HP motor
- * Bird Cent Centrifuge, 36" x 72", Stellite tip
- * Podbielniak Model 9000-S, 5 S Centrifuge
- * Faine 5' x 4' S S Vacuum continuous Filter
- * Tyler single deck Model 100 Screen 18"x48"
- * W & P Mixers, Jacketed 30" x 33" x 20" (2)
- * Diamond 2 Sigma Arm Mixers, 125 gal cas
- * Moore Ball Mills, 4' x 5, 4' x 5', 6hd mtr
- * Baker-Perkins 20 cu ft double sigma Mixer
- * Fitzpatrick Model D Mill, 5 HP
- * J H Day 10" x 40", 3 roll Paint Mill wtr cool
- * Devine Vac Shelf Dryer 5 shelves 38" x 44"
- * Devine Vac Shelf Dryer 20 shelves 40" x 42"
- * Simpson Size O Intensive Mixer, 1 1/2 cu ft cap
- * Model B Stokes-wrap, Complete (2)
- * Std Knapp Model 429 top and bot, 6' comp
- * Separator 8' Raymond single whizzer 7 1/2 HP
- * Pfaudler 300 gal S.S. Reactor S.S. Agit
- * 6000 Gal Inconel Pressure Tank with coil
- * 2500 Gal Inconel Pressure Tank with coil
- * 2-450 gal S.S. Tanks with agitators
- * 5000 Gal S.S. Tank with coil
- * Syntrol spiral Vibrator Elevator S.S. cont

FOR SALE

W&P 100 GAL WC MIXERS
B&P LAB 2 1/4 gal MIXERS new
ROBINSON 1500# S/S RIBBON MIXER
LIGHTNIN 3HP PORT AGIT new
SPARKLER S/S FILTER 33D17
PATTERSON 5x6 JACKETED STEEL
BALL MILL
PATTERSON 4x5 BUHRSTONE PEBBLE
MILLS
BUFLOVAK DOUBLE DRUM DRYER
32" x 52"
MIKRO 2DH TANDEM PULVERIZERS
MIKRO 3TH PULVERIZER
SPERRY 12" P&F NICKEL FILTER PRESS
OTHER P&F and recessed plate FILTER
PRESSES in stock
100 S/S KETTLES from 2 1/4 to 125 Gal
S/S OR PLAIN STEEL TANKS IN STOCK

We buy one item to complete plant—additional equipment in stock.

Send Us Your Inquiries

AARON Equipment Company

1347 So. Ashland Ave., Chicago 8, Illinois
PHONE: CHESAPEAKE 3-5360

STORAGE TANKS

—Prompt Shipment—

GLASS LINED TANKS — USED — 3000 gallon capacity. Welded construction — Fully insulated. Equipped with man-head. Suitable for milk, food products, lily white chemicals, solvents and fine lacquers.

VARNISH TANKS — USED 54" diameter x 14'6" high (or long) 1/4" Steel — Welded construction — 1700 gallons.

MISCELLANEOUS TANKS—Various sizes and types.

ERMAN-HOWELL DIVISION

LURIA STEEL & TRADING CORP.

332 South Michigan Ave.
Chicago 4, Ill.

Telephone: Wabash 2-0250

GOOD USED EQUIPMENT

MACHINERY AND EQUIPMENT COMPANY

514 Bryant Street • San Francisco 7, Calif.

FOR SALE

OLIVER UNITED FILTERS

Two 11'8" x 18'0" Oliver United Filters, having a filtration area of approximately 650 sq. ft. with all accessory equipment necessary to put into immediate operation.

EDGAR PLASTIC KAOLIN COMPANY
EDGAR, FLORIDA—phone: 2831-Hawthorne

FOR SALE L&N INSTRUMENTS

LARGE QUANTITIES of SURPLUS L&N MICRO-MAX STRIP CHART RECORDING CONTROLS (electric) in excellent condition. THERMO-OHM CALIBRATION; can convert to THERMO-COUPLE CALIBRATION.
INSTRUMENT SERVICE ENGINEERING LABS.
1205 LAMAR ST. DAYTON 4, OHIO

EQUIPONOMICS

BIRD CONT. CENTRIFUGE—36" x 50", S.S. 304 COLLOID MILLS—All S.S. Construction, 3", 6", & 10" with mortars
CONDENSERS—S.S. tubes, 84 sq. ft., 940 sq. ft.
MIXERS, D. A.—Sigma Blade, Jktd. Steel & S.S. 2 1/2, 50, 60, 75, 200 Gallon.
NICKEL CLAD KETTLE, Jktd. Agit. 750 Gal. ASME
PFAUDLER G/L CONDENSER—30 sq. ft.
PRESSES—18" x 18, 30" x 30", 36" x 30", 43" x 43".
VULCANIZER—4' x 15", ASME Code.

We Buy Surplus Equipment and Complete Plants

PROCESS PLANTS SERVICE, Inc.

333 Rahway Avenue Elizabeth, N. J.
Phone: Elizabeth 4-2722

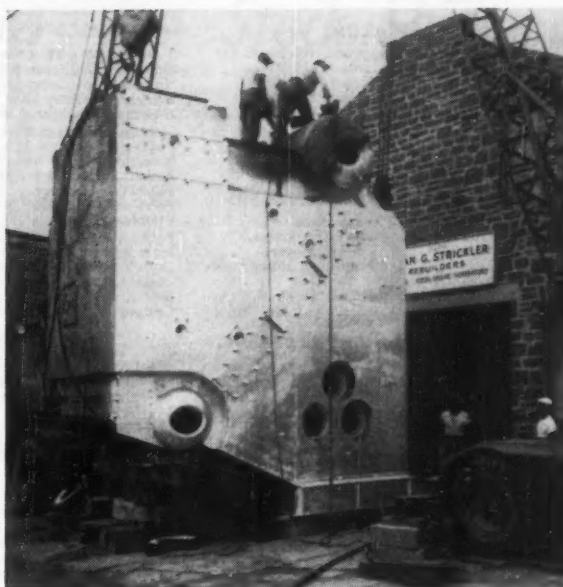
EXISTING BOILERS AVAILABLE

PICTURED

Pictured is a nearly new 40,000 LB/HR., 300 PSI modern steel encased, oil fired, watertube package type steam generator remanufactured at our large, modern plant being loaded for shipment to customer.

Six (6) units presently available. Write for data sheet 25-35-50. Like new—remanufactured package steam generator.

Modern—New 1949 Steam Electric Generating Plant. 50,000 lbs/hr. 450 psi Boiler with Waterwalls, Super-Heater and Bailey Control and 3000 KW. 3/60/4160/2300 volt AC Generator.



FIRE TUBE

Reference Number	Make	Quan.	Steam capacity	Working pressure	Present fuel	Reference Number	Make	Quan.	Steam capacity	Working pressure	Present fuel
6	Cleaver Brooks	1	17,000#	200 PSI	Heavy Oil	628	Cleaver Brooks	1	5,200#	150 PSI	Heavy Oil
627	Cleaver Brooks	1	17,000#	150 PSI	Heavy Oil	612	Cleaver Brooks	1	4,300#	125 PSI	Heavy Oil
637	Cleaver Brooks	1	15,500#	150 PSI	Heavy Oil	638	Cleaver Brooks	1	4,300#	150 PSI	No. 5 Oil
635	Cleaver Brooks	1	13,800#	150 PSI	Heavy Oil	753	Cyclotherm	2	2,760#	100 PSI	Light Oil
631	Cleaver Brooks	1	12,000#	150 PSI	Heavy Oil	752	Cyclotherm	1	2,600#	125 PSI	Light Oil
758	Cyclotherm	1	10,500#	200 PSI	Heavy Oil	639	Cleaver Brooks	2	2,070#	85 PSI	Light Oil
283	Preferred	2	10,500#	150 PSI	Heavy Oil	640	Cleaver Brooks	2	2,070#	85 PSI	Gas
630	Cleaver Brooks	1	8,600#	150 PSI	Heavy Oil	641	Cleaver Brooks	1	2,070#	85 PSI	No. 5 Oil
462	Ames	1	6,900#	100 PSI	Heavy Oil	636	Cleaver Brooks	1	1,725#	100 PSI	Light Oil

WATER TUBE

Reference Number	Make	Quan.	Steam capacity	Working pressure	Present fuel	Reference Number	Make	Quan.	Steam capacity	Working pressure	Present fuel
35-7	Foster Wheeler	2	45,000#	450 PSI	Heavy Oil	35-9	Babcock & Wilcox	5	15,000#	250 PSI	Heavy Oil
35-30	Foster Wheeler	6	40,000#	300 PSI	Heavy Oil	374	Titusville	1	12,000#	200 PSI	Heavy Oil

NEW-USED BOILERS

Reference Number	Make	Steam capacity	Working pressure	Present fuel	Reference Number	Make	Steam Capacity	Working pressure	Present fuel
237	Combustion	140,000	450 PSI	Oil-Gas	310	(2) Cyclotherm	17,000	200 PSI	Gas-Oil
482	Erie City	60,000	160 PSI	Coal	461	Edgemoor	3,450	125 PSI	Oil-Gas
198	B&W	20,000	160 PSI	Coal	460	Edgemoor	2,600	125 PSI	Oil-Gas
633	Cleaver Brooks	17,000	200 PSI	Oil	131	Vapor Clarkson	2,070	300 PSI	Oil

HOW ARE YOU FIXED FOR STEAM—
BETTER WRITE OR SEE

CABLE

Strick-Washington
Phone: Curtis 7-2772

5220 Pennington Avenue

STRICKLER ENGINEERING CORPORATION

Since 1947 a name synonymous with boilers.

Phone: Curtis 7-2772

AT NIGHT

Washington, D. C.
Lockwood 4-8169

Baltimore 26, Maryland

DEPENDABLE EQUIPMENT FROM LOEB—

AGITATORS

- 9—Alsop 5 hp. explo. proof, 420 RPM.
- 3—Alsop 3 hp. explo. proof, 420 RPM.
- 7—Alsop 2 hp. explo. proof, 420 RPM.
- 4—Alsop 1 hp. explo. proof, 420 RPM.
- 2—International 1 hp., 1725 RPM.
- 1—Porter 1 hp., 420 RPM.
- 1—Lightin 3/4 hp., 1725 RPM., TEFC.
- 1—Lightin 1/2 hp., 430 RPM., TEFC.
- 1—Lightin 2 hp., 1140 RPM., TEFC.

CENTRIFUGALS & CLARIFIERS

- 2—DeLaval 84-51, 3 hp. motors.
- 1—DeLaval SVK54 with 10 hp. motor.
- 1—DeLaval 94-21 with 5 hp. motor.
- 1—Tolhurst 32" suspended, rubber covered.
- 1—Tolhurst 18" suspended, st. steel.

DRYERS

- 1—Porter Devine 2 x 4' vacuum drum, 318 S.S.
- 2—6 x 50' Lacy direct heat.
- 1—Buffalo Vacuum Shelf, 5 42 x 42" shelves.
- 1—7' x 80' direct heat.
- 1—3' x 24' Hardinge direct heat.

FILTERS

- 1—Oliver 3 x 4' phosphur bronze.
- 1—Oliver 2 1/2 x 1' monel metal.
- 1—Oliver 8 x 14' iron and wood.
- 1—Falcac 10 1/2" x 16".
- 12—Filter Presses: cast iron, alum., wood, from 7" to 30".
- 7—Internal Pressure—Alsop, Sparkler.

KETTLES

- 1—Devine 1500 gal. Jack., agit.
- 15—St. Steel jacketed, 20 to 100 gal.
- 4—St. Steel agitated Cookers.

We are always interested in purchasing your surplus equipment for cash. Send us your listings.

LOEB EQUIPMENT SUPPLY CO.

818 West Superior St.
Telephone: Seeley 8-1431

MILLS & PULVERIZERS

- 3-roll Day 5 x 12, 12 x 32, 16 x 40".
- Hammer: Williams BX, 60 hp.
- Hammer: Williams #2 slugger, 40 hp.
- Hammer: Jeffrey 30 x 24 type A, 40 hp.
- Hammer: Raymond 16", 7 1/2 hp.
- Pulverizer: Micro 2DH, 10 hp. (New).
- Pulverizer: Micro 2TH, 15 hp.
- Hammer: Gump Bar-Wun, 20 hp.
- Attrition: Sprout-Waldron 36", 50 hp.
- Pebble: Abbe por. lined, 50 gal.
- Pebble: Abbe buhr. lined, 100 gal.
- Pebble: Patterson buhr. lined, 220 gal.
- Pebble: Hardinge buhr. lined, 5' x 38".
- Imp: Raymond #40, 50 hp.
- Colloid: Charlotte W-10, st. st., 1 hp.
- Colloid: Charlotte 10, st. st., 3 hp.
- Colloid: Premier 3" s. st., 7 1/2 hp.
- Colloid: Premier U-3, 7 1/2 hp.

MIXERS

- 4—Baker-Perkins 100 gal. jacketed.
- 7—Double arm sigma blade 5-100 gal.
- 14—Single arm sigma blade 30-100 gal.
- 18—Dry Powder—1 1/2 to 77 cu. ft. cap.
- 3—Day, Ross 40 gal. pony.
- 1—Olsen & Tilgner 100 gal. change can.
- 6—Olsen & Tilgner 100-150 gal. lead-color.

MISCELLANEOUS

- Feeders: Syntrol Vibratlow F-22-new.
- Rotary Cutter: Ball & Jewell #1 1/2, 20 hp.
- Condensers: Tubular st. st., 16 sq. ft.
- Heat Exchanger: Karbate 16.5 sq. ft.
- Tubular Heater: CP, st. st., 55 sq. ft.
- Scoops: Hopper batch type 50-2000 lb.
- Dust Collector: Pangborn, 2500 CFM.
- Screens: Rotex 40 x 84", 42 x 48".
- Pumps: Centrifugal, rotary and gear, vacuum—large stock.

JUST PURCHASED

- 1—Struthers Wells, 6' x 9' jkt'd., SS clad, Rotary MIXER.
- 6—SS clad MIXERS, jkt'd., 67, 27, & 10 cu. ft.
- 1—Unused Struthers Wells, SS Clad, jkt'd., REACTOR 750 gal. 5' x 4'6", SS agitator.
- 1—16" x 12'6" jkt'd. Rotary DRYER.
- 1—16" x 12'6" gas fired KILN.
- 1—4' x 4' porcelain lined, jkt'd., PEBBLE MILL.
- 1—B. & J. #1 Rotary CUTTER.
- 1—Stokes 243D, Oscillating GRANULATOR, steel.
- 4—Porter, SS, AGITATORS side entering, 2 HP, V-Belt.
- 1—Jeffrey, SS, 4" x 7", Vibrating CONVEYOR.
- 1—Worthington Ammonia EVAPORATOR 860 sq. ft., 8 pass.
- 1—Worthington Ammonia CONDENSER 855 sq. ft., 8 pass.

8,100 KVA DIESEL POWER PLANT

(Will be sold complete or as individual units)

having 3—Busch Sulzer (Nordberg), 3060 HP, 240 RPM Diesel Engines, direct coupled to 3—2700 KVA E.M.C. Alternators 3/60/2300/4160, with all accessories. Can be seen in operation.

HEAT & POWER CO., Inc.

70 PINE ST. NEW YORK 5, N. Y.
HANOVER 2-4890
Machinery & Equipment Merchants

BIG SAVINGS IN GUARANTEED EQUIPMENT

DRYERS & KILNS

- Procter & Schwartz Autom. Soap Chip Dryer
- 1—Stokes 2' x 5' Rotary Vac. Dryer
- Devine #12 Vac. Shelf Dryer 40" x 42" Shelves.
- Gen. Amer 2' x 1' Continuous Rotary Vac. Filter
- 2—Abright-Wall 4' x 5' Atmos. Drum Dryers.
- 1—Buffalo Vac. Drum Dryer 24" x 20".

CENTRIFUGALS & CENTRIFUGES

- 4—Tolhurst 40" Suspended Type Centrifugals.
- 6—Centrifugals 12", 30", 40" & 48" Steel, Copper, Stainless & Rubber Lined.
- 6—Sharples Centrifuges #3A Stainless. Also #6.
- 3—De Laval Multiple Clarifiers #200, 300 & 301.

FILTERS

- 1—Vallez 41 Stainless Covered Leaf Filter, type 49.
- Sperry & Shriver 12" to 36" st., iron & wood.
- Sweetland & Oliver Rotary Vac. Filters.

KETTLES & TANKS

- 1—Dopp 350 gal. C.I. Jack. Vac. Kettle.
- Devine & Stokes Impreg. Units 30" & 36" dia.
- Devine 1000 gal. closed Jack. Steel Kettle.
- 1—2300 gal. vert. agit. Jack. Steel Kettle.
- 6—Jacketed Kettles 50 to 2500 gals.
- 1—250 gal. Lead-Lined Kettle.
- 30—Stainless Alum., Copper, Glass & Lead Lined Kettles & Tanks. Also new Stainless.
- 1—250 gal. vert. Copper Jack. Kettle.

PULVERIZERS & MILLS

- 2—Mikro Pulverizers #2TH & 4TH.
- Patterson 30" x 42", 6' x 5', 6' x 8' Pebble Mills.
- Abbe 36" x 30" & 30" x 36" Pebble Mills. Also Jar Mills.
- #1 Raymond Automatic Pulverizer 20 H.P. motor.
- #1 Raymond #50 Pulverizer 30 H.P. Complete.
- 4—#5000 Raymond Mills.
- Sturtevant #5, 18" Mined Hammer Mill.
- Jeffrey 18" x 18" Single Roll Crusher.
- Buchanan 9" x 12" Jaw Crusher.

NEW TANKS, STAINLESS & CARBON STEEL, BUILT TO YOUR SPECIFICATIONS
WE BUY YOUR SURPLUS MACHINERY & COMPLETE PLANTS
PARTIAL LISTING, WRITE FOR BULLETINS

STEIN EQUIPMENT COMPANY

107 - 8th St. Brooklyn 15, N. Y. Sterling 8-1944 Cable Machequip

- Hammer Mills & Pulverizers 3 to 50 H.P.
- 1—Schutz-O'Neil 20" Pulverizers. Also #1.
- Williams #3 & 2x Hammer Mills.
- 1—Robinson 18" x 22" Attrition Mills.
- 1—Lehman 4 Roll W.C. 12 x 30" Steel Mill.
- 3—Steel 3 Roll Mills 9"x32", 12"x30" & 16"x40".
- 1—9" x 24 3/4 pr. high steel Roller Mills.
- 3—Heuchin 18"x36", 4 Roll Granite Stone Mills.
- Ball & Jewell Rotary Cutters, Midget Lab. & #1.
- 2—U. S. & Premier 1 1/2 H.P. Colloid Mills.

MIXERS & SCREENS

- Baker Perkins double arm 100, 50 & 9 gals.
- 2—Read 50 & 100 gal. double arm mixers.
- 2—American Tool 300 gal. Churns.
- Horiz. Mixers single & double arm to 200 gal.
- 3—Day 6, 15 & 40 gal. Pony Mixers.
- Read 40 & 80 qt. vert. Mixer.
- 6—Lead & Paste Mixers 50 to 150 gals.
- 1—Tyler 3' x 5' Vibratory 2 Deck Screen.
- Blystone 3000# horiz. spiral mixer.
- 10—Dry Spiral Mixers 50 to 3000#.
- 12—Portable Elec. Agitators 1/2 to 3 H.P.

MISC. & SPECIAL

- Leominster 8 oz. Injection Molding Machine.
- Kux 2 1/2" single punch Preform Machine.
- Anderson & French Oil Expellers.
- 150 gal. Post or Change Can Mixer.
- Gould 75 HP Centrifugal Pump, 250 PSI.
- Pneumatic Scale Automatic Capser M.D.
- 1—Marco 200 Stainless Steel Homogenizer.
- Filling Machines powder, paste & liquid.
- Rotary & Single Punch Tablet Machines, 1/2" to 4".
- 1—Hew Megui Barrel & Bag Picker.
- 2—Worthington 12" x 12" x 12" Vac. Pumps.
- 6—Devine Stokes & Buffalo Vac. Pumps.
- Soap Machinery for Toilet, Laundry, Chip, Liquid.
- Plastic & Rubber Mills & Calenders.
- Plastic & Rubber Hydr. Presses, Extruders & Injection Molding Equipment.
- Banbury Mixers.

DRYERS AT TERRIFIC SAVINGS

- 1—Carrier Truck Dryer 8, 16 & 24 Trucks w/Aerofin Heating Coils, Blowers & Glass Enameled Trays.
- 1—Bufflovak Vacuum Shelf Dryer 20 Shelves 42" x 42" w/Condenser & Rec. & Vac. Pump.
- 3—Stokes Model 138-F Vacuum Shelf Dryers 6 Shelves 24" x 36".
- 4—Devine #27 Double Door Vacuum Shelf Dryers 17 Shelves 59" x 78" w/Condensers & Receivers.
- 4—Devine #28 Double Door Vacuum Shelf Dryers 20 Shelves 59" x 78" w/Condensers & Receivers.
- 1—Al. Nell 4' x 9' Double Drum Atmos. Dryer.
- 1—Stokes 38A Steam Heated Dryer—16 Shelves 35" x 28".
- 1—Bufflovak 6' dia. Jack. Vacuum Crystallizer.
- 1—Swenson Rubber Lined Cont. Vacuum Cooling & Crystallizing Bodies. 1670# Crystals per hr.

MISC.

110 Gal. 2000 psi. Autoclave; W & P 100 & 200 Gal. Mixers; Sifters; Pulverizers; Tanks; Kettles; Reactors; Filters; Filter Presses etc.

Send us your inquiries. We buy single items to complete plants.

The MACHINERY & EQUIPMENT CORP.

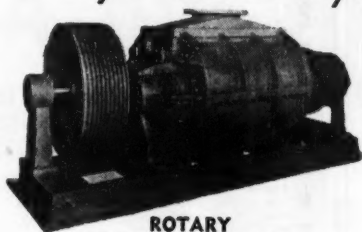
333 West Broadway New York 12, N. Y.
GRamercy 5-6680

Newark Warehouse—290 Frelinghuysen Ave.,
Telbot 4-2656

FANS . . . BLOWERS . . . EXHAUSTERS

NEW AND REBUILT

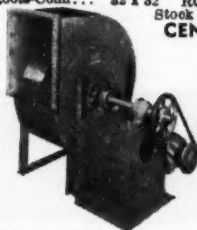
30% to 50% Savings — — Stock Shipment



**ROTARY
POSITIVE BLOWERS**

MAKE	SIZE	TYPE	Max. Press.	Max. CFM
Roots-Conn...	8 x 20	RCR	3.6	955
Sutorbilt...	18 x 42	XB	4	5320
Roots-Conn...	22 x 36	RCD	5	5500
Roots-Conn...	67	AF	5	164
Roots-Conn...	14 x 26	RCR	5	3580
Roots-Conn...	16 x 24	RCD	5	2515
Roots-Conn...	10 x 18	RCD	6	805
Roots-Conn...	10 x 12	RCS	7	614
Roots-Conn...	76	AF	7	200
Sutorbilt...	5H	Cal.	10	66
Sutorbilt...	8H	Cal.	10	272
Roots-Conn...	10 x 10	RCR	10	616
Roots-Conn...	24 x 23	RCDH	7.5	8610
Roots-Conn...	32 x 32	RCDH	7.5	14950

Stock List: RP-100



CENTRIFUGAL FANS

MAKE	SIZE
American.....	11
American.....	9
Clarage.....	3 1/4
Bayley.....	8
New York.....	36
Sturtevant.....	6

Stock List: BC054

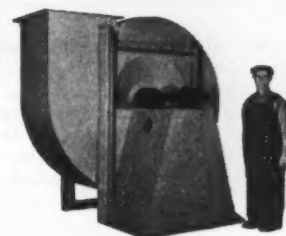


TURBO BLOWERS

Stock No.	Make	Size	HP	Vol.	Press. -oz.
1601	General Blower	1630	30	3600	16
1629	Ingersoll Rand	F8577	150	15000	20
2415	Spencer	1515-H	15	1425	24
3220	Spencer	2020	20	1300	32
693	Allen Billmeyer	D-6	7 1/4	275	48
1000	Spencer	Special	200	8200	48

Stock List: TB155

**FULLY
GUARANTEED**



STEEL PLATE EXHAUSTERS

MAKE	SIZE	TYPE	Wheel Diam.	Inlet Diam.
Sturtevant...	100	Des. 3	72 1/4	38
Sturtevant...	70	Des. 3	49 1/4	26
American...	80	ELS	48 1/4	29 1/4
American...	70	ELS	42 1/4	25 1/4
Sturtevant...	55	ELS	36 1/4	23
Sturtevant...	50	Des. 3	36	19
New York...	33	OI	33	21 1/4
Buffalo...	45	MW	32	19 1/4
American...	50	ELS	31	18 1/4
Gen. Blower...	45	MX	27	18 1/4
American...	35	E	23	15
Sturtevant...	30	Des. 2	18	11
American...	3	VRV	13	7
American...	3	V	12	7

Stock List: MX115

We feature all leading makes

WM. W. MEYER & SONS, INC.

8243 ELMWOOD AVE., SKOKIE, ILL.

Chicago Suburb

Chicago Telephone — KEystone 9-8260

"BLUE CHIP EQUIPMENT"---WE OWN---PRICED RIGHT!

- 2 Sharples C-20 Super dehydrators stainless construction
- 2 Baker Perkins 100 gal. J.N.M. Mixers 20 HP X proof motors—1 Vacuum, both Sigma blade
- 6 Stokes and Bufllovak and Devine 3-4-6-8 and 17 Shelf single and double door dryers.
- Sweetland #12 Filter 502 sq. ft. Hydraulic closure
- 2 40" Stainless steel Centerfuges—link suspended 7 1/2 HP motors
- 9 new Kingsford Stainless steel 2" Pumps
- Shriver 36" x 36" 21 chamber iron 4 eye closed delivery
- 2 7500 # dry powder mixers
- Baird 4' x 40' direct heat dryers—1 oil and 2 gas fired
- 8 Shriver 18" Centerfeed Iron Filter presses
- 3 Bird 40" suspended steel basket centerfuge 40/20 HP motors
- 1 Ruggles Coles 4' x 30"—complete
- 1 Bufllovak "Monel" 2 effect evaporator
- 1 Hershey Monel 3' x 24' direct heat
- 10 Stainless Vacuum pans 80-650 Gal some with agitators
- 4 Micro Bantam, #1, #2, #4 Mills
- 15 Porter, Phil. and Netto Agitator Drives 1/2 to 25 HP
- 4 Ball & Jewell and Cumberland Rotary Cutters size 1/2, 1 and 2
- Baker Perkins 500 Gal "Unidor" Jacketed Sigma Blade Mixer
- Colton #5 1/2 Tablet Machine variable speed drive and 5 HP
- 5 Tyler Niagara Stainless Steel sifters 2' x 8' and 3' x 8'.
- 4 Pfaudler 500 Gal glass lined and agitated reactors
- 2 new Karbate Heat Exchangers 25 and 70 sq. ft.
- Oliver Pressure Precast 5'3" x 3' all steel filter
- Shriver 18" bronze 41 57.1 sq. ft. filter
- Shriver 24" lead filter press 67 sq. ft. and 11 cu. ft. of cake
- 6 Day 10-20-50-100 Gal double arm mixers

- Abey engineering 90 gal jacketed ball mill with motor
- Feine 5' x 3' "All monel" string discharge filter
- 4 Louisville 4' x 25'; 4' x 30'; 5' x 35' tubular dryers
 - 1 Bufllovak 32" x 52" double drum dryer with 10 HP Motor
 - American Tool 40" suspended bronze perforated basket 20/10 HP
 - Devine and Acme steel 1 and 2 effect evaporators
 - Proctor and Schwartz 2 truck steam dryer
 - Elmco 4' x 1' Steel Vac filter (closed system)
 - 3 Acid proof tile lined ADG tank 500-1700 Gal
 - 300 Gal jacketed ribbon blender 40 HP motor
 - 2 Blaw Knox jacketed agitated autoclaves high pressure 250 gal.
 - 12 aluminum 600 and 400 sq. ft. heat exchangers like new
 - 12 stainless condensers 10 to 184 sq. ft. Stainless 304.
 - 12750 gal storage tank
 - 3 36" copper coating pans
 - 2 Simpson and Ross 8' diameter mixers with motors
 - 15 HP package boiler oil fired
 - 15 Stainless and copper jacketed agitated kettles 10 to 300 gal.

EXTRA

EXTRA

SPECIAL

Ammonia Sulphate liquidation—New York City.

Vitamin recovery liquidation—Georgia

Distilling plant—New England

Send for bulletins covering the above. This is but a sample of our vast inventory.

CHEMICAL & PROCESS MACHINERY CORP.

146 GRAND STREET
NEW YORK 13, N. Y.

WOrth 6-3430

FACTORY: 52 NINTH St.
BROOKLYN 15, N. Y.

LIQUIDATING LARGE MODERN CHEMICAL PLANT

BUILT 1946 LOCATION: Springfield, Oregon

All Facilities, including Machinery, Equipment and Buildings, Located on Approximately

12 ACRES

Equipment in excellent condition and still set up as operated for a very limited period.

Plant built for production of Ethyl Alcohol by special fermentation process, but may be readily converted for other products, due to broad variety, modern design and arrangement of equipment.

Plant site improved with railroad sidings, sewers, roads, water and fire lines, waste disposal ponds.

Some of the Major Items of Process Equipment listed herewith—
Detailed List in Preparation:

PERCOLATION SYSTEM

- 5—8' dia. x 37'6" (vertical closed top) steel tanks, Everdur lined.
- 1—3 roll lignin press.
- 5—Flash tanks with Centrifugal Separators.
- 2—Kelly 650 Twin Filters (1300 sq. ft. each).
- 4—Heater—Condensers steel shell, copper tubes, 30" dia. x 12 ft. long.
- 2—Sweetland Filters—570 sq. ft. each.
- Tanks, Motor Driven Pumps, Conveyors, hogs, instruments, scales.
- 1—Rotary self-classifying lime slaker 5'6" x 25'.

FERMENTATION SYSTEM

- 10—26' dia. x 16'4" (vertical closed top) Fermenters (Cone bottoms) agitated.
- 5—Centrifugal Yeast Separators—individually Motor Driven. Complete Yeast Culture Equipment.
- 1—175 magne pure culture yeast apparatus.
- 2—Beer Wells 26' dia. x 16'4", 20 p.s.i.
- 16—Fermentation Agitators, Model SEV 2500, SEV 300.

DISTILLATION SYSTEM

- 2—Beer Heat Exchangers, 271 sq. ft. Copper Tubes.
- 1—Pressure Beer Still, copper, 6' dia. x 52' high, 30 plates.
- 1—Vacuum Beer Still, copper, 5'6" dia. x 52' high, 30 plates.
- 1—Steam Generator, 92" dia. x 20' long.
- 1—Vacuum Rectifying Column, copper, 5'6" dia. x 48'6" high, 43 Bubble Cap Plates.
- 1—Purifying Column, copper, 4'6" dia. x 60' high. (Above distillation units operated under vacuum and complete with heaters, coolers, condensers, rotameters, recording controllers, ejectors, pumps and interconnecting piping, etc.)
- 1—Tubular Calandria, 2'10" dia. x 7' long.
- 1—Alcohol Vaporizer, copper, 5' dia. x 6' long.

EVAPORATOR SYSTEM

- 1—Quadruple Effect Conkey Evaporator, 5870 sq. ft. heating surface. Complete with pumps, instruments, and accessories.

COMPLETE POWER PLANT

Consisting of Babcock and Wilcox Water tube boilers, minimum 40,000⁺ steam, 225⁺ pressure. Air compressors. De-aerating Feed Water Heater, Pumps, etc.

CHEMICAL LABORATORY

FOR SALE AS A WHOLE OR ENTIRE UNITS

Inspection invited: 7 Miles from Eugene, Oregon

HUGO NEU CORPORATION

31 NASSAU STREET • NEW YORK 5, N. Y. • Tel. Rector 2-1334

TANKS — BOILERS — PUMPS

NEW and USED
SPECIAL

Quantity	Diam.	Length	Shell	Heads	Capacity	Price
2—Tanks	6'	32'	5/16"	1/4"	11,160 gal.	\$1,100 each
3—Tanks	9'	36'	3/8"	1/2"	15,500 gal.	1,500 each
8—Tanks	18'	28'	1/4"	1/4"	38,948 gal.	1,650 each

F.O.B. ROCHESTER, N. Y.

- 4—Vert. Tanks, 26' dia. 19'6" high, 100,000 gals. each, welded, heavy plate.
- 1—New Louisville DeWatering Press, 8-roll, 2' wide.
- 1—New Louisville Conveyor, 2'x15'.

Large Stock of Chemical Plant Equipment

MIXERS — FILTERS — CONDENSERS — BALL MILLS — PULVERIZERS — HEAT EXCHANGERS — DRYERS — AMMONIA & FREON COMPRESSORS — EXTRACTORS — HAMMER MILLS — STEAM JACKETED KETTLES — STAINLESS STEEL TANKS — CONVEYOR — MOTORS — CRYSTALLIZERS — POWDER FILLERS — TABLET MACHINES — S. S. VALVES

H. LOEB & SON :: 4643 LANCASTER AVENUE PHILADELPHIA 31, PA.

FOR SALE

2000 gal. Horiz. S.S. Tank, 8' x 14'
Double Effect S.S. Evaporator.
Burovac S.S. Spray Dryer, 500 lb. per hr.
22" x 52" x 36" x 54" Double Drum Dryers.
50 to 200 gal. S.S. Mix Tanks, water jkt.
250 gal. Vert. S.S. Closed Tanks, agit.
300 gal. Horiz. S.S. Tank 3' x 7' agit.
650 gal. Horiz. S.S. Tank 4' x 7'
3,000 gal. S.S. Truck Tanks, Trailered.
75 gal. Monel Jkt. Kettle, 35" x 22".
4-50 gal. Steel Kettles, 75" jkt., A.S.M.E.
75 to 1,500 gal. Homogenizers or Viscolizers
25" Centrifugal Extractors, copper baskets
Model 148C Stokes High Vacuum Pump, 1 1/2 H.P.
35 H.P. International Boiler, Oil Fired.
Fitzpatrick "M" Hammer Mill, 1 1/2 H.P., S.S.
30 Ton Howe Suspension Tank Scale.

Send us your inquiries

LESTER KEHOE MACHINERY CORP.
1 East 42nd Street New York 17, N. Y.
Murray Hill 2-4616

For Sale

- 1—Eppenbach Stainless Steel Home Mixer, complete with a 7 1/2 HP Explosion-Proof Motor.
- 1—Baker-Parkins 100 Gal. Stainless Steel Mixer, double-arm, alpha blades, with 25 hp explosion-proof motor.
- 1—J. H. Day #2, 75 Gal. Brighton Mixer.
- 5—Pebble Mills 48 to 500 Gal.
- 10—Pony Mixers, 8, 15 and 40 gal.
- 1—HIGH SPEED Roller Mills 8"x24" to 10"x40".
- 1—Motor Driven Belt Conveyor.
- 3—6" Premier Colloid Mills, watercooled.
- 2—2251 Mikro-Pulverizers with 10 hp Motors.

SPECIALIZING IN REBUILD MACHINERY

Irving Barcan Company

249 ORIENT AVE.
JERSEY CITY 5, N. J.

Phone—DElaware 2-6695-6

For Sale

Need Air?

CALL

AMERICAN AIR OF JERSEY

AIR FOR SALE OR RENT

SINCE 1902

GAS • DIESEL • STEAM • ELECTRIC

New and Quality Rebuilds

STATIONARY

- 48.6 CFM 3500 psi stage Ingersoll Rand 25 HP Elec
- 122 CFM 100 psi 7x7 Werthington HB 20 HP Elec
- 128 CFM 100 psi 8 1/2 x 4 1/2 Davey V59 6 available
- 142 CFM 125 psi 6/6x5 Worth M-25 25 HP Elec
- 254 CFM 125 psi 10x10 Ingersoll ER-1 40 HP Elec
- 268 CFM 300 psi 10/4 1/2 x 10 Ingersoll 75 HP Synch.
- 270 CFM 125 psi Joy WL-60 2 available
- 278 CFM 125 psi 2 Stage Chicago PB 50 HP Elec
- 285 CFM 125 psi 2 Stage Gardner "WB" 50 HP
- 289 CFM 100 psi 3 cylinder Davey 50 HP Elec
- 291 CFM 40 psi 3 cylinder Ingersoll Type 40

Two available

- 295 CFM 125 psi 10x11 Chicago T-B 2 available
- 312 CFM 100 psi 4 cyl. Gardner "AAG" —60 HP
- 343 CFM 500 psi 11/5x13 Worth. HB2 Elec or Steam
- 364 CFM 20 psi 12 x 7 Gardner "RX" 2 available
- 435 CFM 100 "Unifair" Joy WL-60 75 HP Elec
- 552 CFM 125 13/8x10 Ingersoll 100 HP Elec
- 560 CFM 125 psi 2 stage Chicago PB8 100 HP Elec
- 782 CFM 110 psi 15 1/2/95x10 Worth DC-2 125 HP
- 931 CFM 50 psi 12x13 Chicago T-B Steam or Elec
- 1085 CFM 35 psi 20x12 Penn S-A 100 HP Elec
- 1574 CFM 100 psi 22/14x16 IR-PRE 2 available
- 1574 CFM 50 psi 15/15x14 Penn DB-1 200 HP Elec
- 1723 CFM 110 psi "XPV" 4 corner Ingersoll Steam

SPECIAL

Compressors for special air applications and conditions

PORTABLE

15 CFM to 600 CFM

VACUUM PUMPS

3 CFM to 5881 CFM

DELIVERIES

Always prompt

American

AIR COMPRESSOR CORP.

NORTH BERGEN, N. J.

Telephone UNION 5-4848

DEPENDABLE PROCESS EQUIPMENT

All Items In Stock . . . Ready for Your Inspection And Immediate Delivery

- S.S. Steam jacket kettles up to 1000 gal.
- Powder mixers 50 to 5000 pounds.
- Charlotte Colloid Mills, M3 & M50.
- 5 Spout SS Paste Filter, Automatic.
- Praudler 10 gal. jkt. glass lined reactor, agitated.
- Praudler & Schwartz Dryer, Gas Fired, 100' long.
- Automatic Large Tube, Crimper & Closer.
- S. S. Tanks 50 to 10,000 gal. agitation avail.
- Boilers 2 h.p. to 1000 h.p. Oil or Gas Fired.
- Mikro Pulverizer 4-TM with extra screens.
- Lehman 5-roll Mill 12" x 36" water cooled.
- Tolhurst 48" Centrifuge.
- Laughlin Continuous Filter.
- Link Belt Shaker 4' x 8'.
- Praudler & Schwartz 84 tray dryer, and 5, 40 trays.
- Portable Electric Mixers 1/3 to 3-h.p.
- Tablet Presses single & rotary.

We Buy and Sell Complete Plants or Single Items

CALL, WIRE, WRITE YArds 7-3665

NEWMAN TALLOW & SOAP MACHINERY CO. INC.
ESTABLISHED IN 1900
1051-59 WEST 35TH STREET
CHICAGO 9, ILLINOIS

EQUIPT. IN CALIF.

ILL. - N. Y. - FLA. - TEX.

48 BALL, ROD & TUBE MILLS

- 10"x48", 8"x48", 8"x22", 6"x22", 6"x36", 5"x36", 3"x7", 4"x5", 4"x7", 4"x14", 5"x10", 5"x14", 5"x18", 6"x7", 6"x6", 6"x5", 6"x10", 7"x5", 7"x6", 7"x7", 8"x12", & 8"x8"

16—ROTARY DRYERS & KILNS

- 3'x26", 4'x26", 4'x42", 5'x35", 6'x45", 6'x50", 11'x75", 6' & 7'x60", 6' & 8'x60", 4-7'x110", 8'x125", 2-10'x125"

3—STEAM TUBE ROTARY DRYERS

LOUISVILLE TYPE 8'x40', 6'x30, 6'x50

CRANES & LOCOMOTIVES

- 4-125 & 44 ton G.E. DIESEL ELEC. LOCOMOTIVES.
- 25 TON AMER. DIESEL LOCO. CRANE.
- 30 TON OHIO DIESEL LOCOMOTIVE CRANE.
- STANHOPE, 60 E. 42nd St., N. Y. 17, N. Y.

HOW TO MAKE A BIG HIT . . .

BUY YOUR EQUIPMENT FROM

GELB

AND HIT THE JACKPOT OF
VALUE AND ECONOMY



THE GELB GIRL—FEBRUARY 1955

- 1—Alley Fabricator, 100 gal. Monel Autoclave jacketed and agitated, 200# internal, 100# jacket ASME.
- 1—International, Stainless Steel Ribbon Mixer 50 cu. ft. w/drive.
- 1—Struther Wells, 24" x 30' Nickle Fractionating Tower 60 psi.

AUTOCLAVES—KETTLES TANKS

- 1—Pfaudler Glass lined, Series R, 500 gal. Jacketed Vacuum Reactor, with Impeller Type Agitator and Drive.
- 3—Open Top Type 316 Stainless Steel Jacketed Kettle, 700 gallons each.
- 2—Open Top Stainless Steel Jacketed Kettles, 600 gal. ea.
- 1—1600 gal. Type 347 Stainless Steel Storage Tank.
- 1—Vertical Storage Tank, 10,000 gal. capacity, 125 psi.
- 1—Walter, Stainless Steel Agitated Jacketed Reactor 60 gal.
- 3—Stainless Steel Jacketed, Agitated Vacuum Kettles 650 gal.
- 1—Struthers Wells Steel Jacketed Vacuum Reactor, 1800 Gals. Cap. with Drive, Turbine Agitator & Coils.
- 12—Koven Stainless Steel Jacketed Vacuum Kettles, 380 Gals. Cap. Each.

CENTRIFUGALS

- 1—DeLaval Type 316 Stainless Steel Multi-Matic Centrifuge.
- 1—Fletcher Stainless Steel Suspended Type Centrifuge, 40" Perforated Basket.
- 1—A. T. & M. Stainless Steel Susp. Centrifuges, 48" Imperforated Basket.
- 1—Sharples Type 316 S.S. Super-D-Hydro., Model No. C-20.

DRYERS—KILNS

- 1—Bufflovak Type 347 Stainless Steel Rotary Vacuum Dryer, 5' x 20'.

- 3—Devine Single Door Vacuum Shelf Dryers, 5-13 shelves.
- 1—Stokes Rotary Vacuum Dryer, 3' x 12'.
- 1—Vulcan Rotary Kiln, 7' x 120'.
- 1—Louisville Experimental Laboratory Dryer, 12" x 7½'.
- 1—Devine #A Laboratory Vacuum Shelf Dryer with 3 Stainless Steel shelves.

FILTERS

- 10—Shriver & Sperry Plate and Frame Filter Presses from 12" to 42".
- 1—Sweetland #2 Stainless Steel Filter.
- 2—Feinc Type 316 Stainless Steel 6'6" x 6' Rotary Vacuum String Discharge Filters, Complete, New.
- 1—Shriver, 36" x 36" cast iron 4-eye closed delivery Filter Press with Hydraulic closing device, 64 chambers.
- 1—Shriver, 30" x 30" cast iron 4-eye closed delivery Filter Press with 34 chambers.

MIXERS

- 6—Simpson Intensive Mixers #0 and #1.
- 4—Baker-Perkins Double Arm Jacketed Sigma Blade Mixers, 100 gal. capacity.
- 1—Baker Perkins Stainless Steel Dispersion Mixer, Size 15, Type VUMM, 100 Gals.
- 1—Struthers Wells Double Arm "North-master" Mixer, 50 Gals. Working Cap., 100 Gals. Total Cap.
- 1—Lancaster, Stainless Steel Muller Mixer Model LW w/motor.
- 1—Baker Perkins, Double Arm Naben Blade Mixer, 100 gal. capacity with hydraulic tilting device.

- 1—Badger 4' x 16' Copper Column 25 bubble cap trays.

- 1—Day 50 gal. Stainless Steel, jacketed double sigma blade mixer.

- 3—Bufflovak Single Door Vacuum Shelf Dryers, 20 shelves each.

- 1—Badger, 5' dia. x 23' Copper Column 20 bubble cap trays (New).

- 1—Sparkler, type 316 Stainless Steel Model 33D9 Filter (NEW).

PULVERIZERS—GRINDERS —MILLS

- 1—Eppenbach QV-8 Stainless Steel Colloid Mill with motor.
- 1—Abbe #00 Rotary Cutter with 3 HP Motor.
- 1—Mikro #2TH Stainless Steel Pulverizer.
- 1—Mikro #3TH Mikro Pulverizer with 30 HP Motor.
- 1—Mikro #3W Pulverizer.

MISCELLANEOUS

- 1—Titusville 100 HP Package Boiler 125 psi ASME, complete.
- 1—IPE Type 316 Stainless Steel 50 sq. ft. Evaporator.
- 1—Lummus Stainless Steel Heat Exchanger, 360 sq. ft.
- 1—Struther Wells, Hastelloy "B" Heat Exchanger 480 sq. ft.

Established 1886

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

U.S. HIGHWAY No. 22,

UNION, N.J.

MURdock 6-4900

PLANT LIQUIDATION

Acme Pellet Co.
Pallets 4' x 4' x 3 1/2"

Bin-Dicator Co.
Model A Bin-Dicators
Micro #y1033-1038

Buell Co.
Buell (Van Tonge dust collector)

Kennedy & Van Seun Co.
5 x 8 Ball Mill Type M-Mech discharge 3 ton
per hr 100 mesh feed size 35 mesh

Link Belt Company
19 ft. elevator complete with drive

Link Elevator Co.
45 ft. elevator complete with drive motor—
Model 5K—203E911-1 HP, 60 cy.—220/440/
318159—RPM 1720

Link Elevator Co.
35 ft. elevator complete with drive

Neuman Bagging Mach.
Nemco #1161

Pangborn Co.
Pangborn #1000 Type CN S—dust collector
unit—complete proposal 453044—Roto Valve
6' x 6' flared top.

Robinson Mfg Co.
Size 28 Style A-two sieve deep Gyto sifter-two
screens complete quotation M2183

Spencer Blower Co.
#46 Hauch Fan Spencer Turbo Co.
Size 1540 H. Ser. H87690
Motor U. S. Motor 40 HP 220/440/3P/60 cy,
Type SC Frame-365-2 RPM 3600

Complete equipment for Pulverizing, Classi-
fying and Bagging Coal or other Solid Mate-
rial.

At Sacrifice Prices!

Most of this material bought 18 months ago—
in use only 3 months. Equipment may be
bought in entirety or individual units.

Universal Road Mach. Co.
5 Gayco Cent. Air Separator 18' higher than
standard—#1140 Size 4 model 44 including
V-belt drive

GE Motor Model 5K2-8401772 7 1/2 HP Type
K Frame 284—220/440/60 cy.—3 P.—1735
RPM Amp. 20.1-10.0

Universal Road Mach. Co.
6' Gayco Cent. Air Separator #1139-18' higher
than standard Size 6—Model 44 including
V-belt drive

GE Motor Model 5KG 284D-986 HP 5 1/2
Type KG-220/440/3 60 RPM—1143 Amp.
15.5-7.6

Universal Road Mach. Co.
8 Gayco Cent. Air Separator #1138—Size 8
Model 34—including V-Belt drive

Squirrel Motor Corp. Motor 7 1/2 HP 220/60/3
P.—1140 RPM 440 cy.

Universal Road Mach. Co.
#1139 Gayco Air Separator complete with motor
—size 18 model 34

Universal Road Mach. Co.
#1132 Gayco Air Separator (Size 18) Model-18
complete with motor.

Yale Fork LIR
Model KG 51 AT—20 HU, Dia "A" Power
R-22A

Load Centre—Max. Cap. Lbs.	
15	3000
18	2500
24	2000
27	1850

Also assorted electrical control panels, motors, speed reducers, etc.

ANTHRACITE EQUIPMENT CORPORATION

Anthracite Institute Building

Wilkes-Barre, Pa.

Phone VA-2-4142

WANTED

RIGHT DOWN OUR ALLEY

—turning your idle
equipment into CASH
—one machine or an
entire plant—quickly—confidentially.



"CONSOLIDATED"

See our advertisement on page 389

WANTED—SURPLUS

Chemicals—Dyes—Drugs
Colors—Pigments—Oils—Waxes
By-Products—Wastes—Equipment

CHEMICAL SERVICE CORP.
80-04 Beaver St. New York 5, NY

WE NEED

All Kinds of Oil Refinery and
Chemical Equipment, also Tanks

Write—Wire—Phone
Weinstein Co., Div. of Surplus &
Salvage Co., Inc.
619 West 8th Street Jamestown, New York

If there is anything you want
that other readers can supply
OR . . . something you don't want—
that other readers can use—

Advertise it in the
SEARCHLIGHT SECTION

FOR SALE DRACCO PNEUMATIC CONVEYING SYSTEM

Includes Receiving station, Rotary Air
Lock, Shakers, Vacuum Pump, 60 h.p.
motor, Unloading Pipe and Hose. Used
6 1/2 Years For Unloading Soda Ash Hop-
per cars. Capacity 10 Tons 1 Hr. Good
Condition. May Be Inspected at Present
Site.

Cowles Chemical Company
Skaneateles Falls, 1, N. Y.

Prompt ANSWERS to business problems . . .

MISCELLANEOUS business problems
are daily being solved quickly and
easily by the use of the Classified
Advertising Sections of this and other
McGraw-Hill publications.

When you want additional employees,
want to buy or sell used or surplus new
equipment, want additional products to
manufacture, seek additional capital, or
have other business wants—advertise
them in the Classified Section for
quick, profitable results!

American Machinist
Aviation Week
Business Week
Bus Transportation
Chemical Engineering
Chemical Week
Coal Age
Construction Methods &
Equipment
Electrical Construction &
Maintenance
Electrical Merchandising
Electrical Wholesaling
Electrical World
Electronics
Eng. & Mining Journal
E. & M. J. Markets
Engineering News-Record
Factory Mgt. & Maintenance
Fleet Owner
Food Engineering
National Petroleum News
Nucleonics
Petroleum Processing
Power
Product Engineering
Textile World

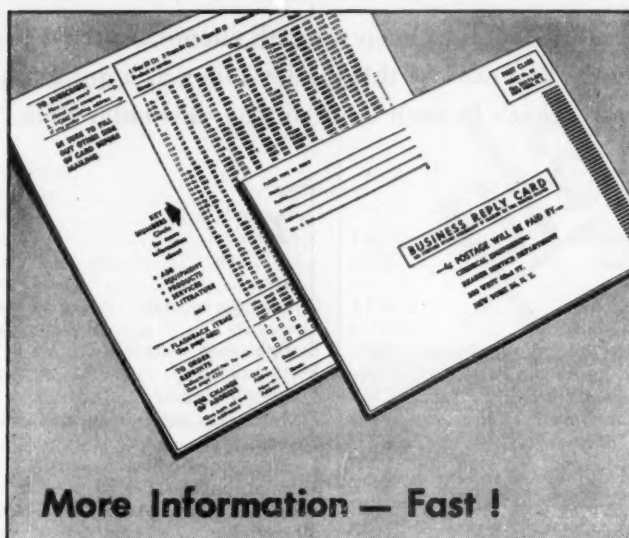
Classified Advertising Division
McGraw-Hill Publishing Co.
330 W. 42nd St., New York City 36, N. Y.

WE NEED Atmospheric double drum dryer

cast iron, drying surface 150 to 200
square feet. Variable drum speed. Send
offers to

W-4987, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

READER SERVICE



More Information — Fast !

INDEX TO CHEMICALS & EQUIPMENT

Chemicals and materials	402
Equipment and accessories	403
Processes and services	410
Flashback: Last month's new products	411

GUIDE TO TECHNICAL LITERATURE

Chemicals and materials	412
Construction materials	418
Electrical equipment	422
Handling and packaging	423
Heating and cooling	424
Instruments and controls	425
Mechanical equipment	422
Pipe, fittings, valves	426
Process equipment	428
Pumps, blowers, compressors	434

INDEX TO ADVERTISERS

Alphabetical list of firms in this issue	436
--	-----

CHECK LIST OF REPRINTS

Editorial reports now available	444
---	-----

READER SERVICE POSTCARDS

Get more information—fast	Inside Cover
-------------------------------------	--------------

Quick way to keep posted.

Now it's easy. Just use CE's new directory of products, equipment and services. It's a complete, finger-tip reference to each month's advertised items and new product developments. (p. 366)

Now—yours for the asking.

You can now get—free and fast—the latest literature on any topic in your field. Our comprehensive checklist can help you keep your technical files up-to-date. (p. 412)

Who's offering what today.

Every month you'll find industry's most progressive firms among CE's ad pages. You can use our advertiser's index to check up on what they're offering that will help you. (p. 436)

For more information—fast!

That's where Reader Service postcards come in. They're easy to use, bring quick results. Try one out today. (Inside Cover)

What It Contains . . .

Here's your complete index to the chemicals, materials, equipment and services advertised in this issue, announced in the Product News and Process Equipment News departments, or listed in this issue's Guide to Technical Literature within this Reader Service section.

What the Code Means . .

Each item has a code that's the key to its location in this issue. The numerals show the page where you'll find the item mentioned. The letters L (left), R (right), T (top), B (bottom) locate ad positions on the page; the letters a, b, c and A, B, C identify items on a page or in an ad.

For More Information . .

You can get more information on any product listed in this directory by using the Reader Service postcard inside the back cover. Simply circle the item's code number on the postcard, then mail to us. Answers will come to you direct from the companies manufacturing the products.

Contents of This Section . .

You'll find the product items in this issue's directory and categorized as follows:

	Page
Chemicals and materials	402
Equipment and accessories	403
Processes and services	410
Checklist of last month's new products	411

Index to Chemicals & Equipment

Find it tough to keep up with chemical products and equipment? You can use this master index as a quick way to spot exactly what's in each issue on any particular item.

Chemicals

ACTH synthesis	148G
Acetazoleamide	20-1a
Acids	
Alkanesulfonic	412A
Alkyl phosphoric	BL433a
Anhydrous, hydrofluoric	266a
Aqueous, hydrofluoric	266c
b-Chloropropionic	412B
Citric, tech. bulletin #15	265a
Hydrobromic	412C
Muriatic	109
Nucleic	146B
Oleic	412D
Oxalic, tech. bulletin #34	265b
Pelargonic	412E
Peracetic	412F
Phenylacetic	412G
Sulfuric, bulletin T-3	55
Additives, paint	148F
Alcohols, bulletin F-4731	143a
Fatty	412H
Tetrahydrofurfuryl, bulletin 87C	297
Alumina	339, 345a
Aluminum, radioactive	148D
Aluminum stearate technical	
D powder	412I
Ammonia	146A, 412J, 311-2b
Anhydrous	20-1h, 412K
Ammonium citrate, tech. bulletin 15	265c
Ammonium oxalate	412L
Ammonium pentaborate	412M
Antioxidants	20-1b
Benzene phosphorous oxydichloride	412N
Benzenes, chlorinated	412O
Boron carbide	247f
Boron trifluoride	266b
Carbon activated	74, 413B
Carbonate of potash	329c
Carbonates, glycol	413C
Catalysts	
Alumina	20-1c
Specialty	413D
Cellulose	410
Cellulose products	78b
Chemical cotton	78c
Chemicals	413E
Industrial	413F
Metal finishing, tech. bulletin 61	265d
Organic	413G
Peroxygen	413H
Petroleum	135
Process	26-7a
Synthetic	413I
Terpene	78d
Chlorinated products	78f
Chlorine, liquid	329a
b-Chloropropionitrile	413J
Clay absorption, radioactive waste	148A

Color	12d
Compounds	
Aluminum	26-7b
Cadmium	26-7c
Zinc	26-7d
Corrugating medium	144C
Defoamers	R433
Diatomaceous materials	331b
Diethylstilbestrol	148C
Dimethylhydrazine	413K
Dodecenylsuccinic anhydride	414A
Dolomite	345c
Dyeing synthetic fibers	414B
Ethanol, bulletin F-4731	143c
Ether anhydrous AR	414C
Fluorocarbon	148H
Glycerine	241
Glycols	414D
Hydrazine	144A
Hydrogen peroxide	414E
12-Hydroxystearin	414F
Isobutyraldehyde	414G
Isopropanol, bulletin F-4731	143d
Magnesia	345d
Magnesite	345e
Maleic anhydrides	414H, 414I, 414J
Methanol	414K
Bulletin F-4731	143b
2-Methyl 5-ethyl pyridine	414L
3-Methyl-1-phenyl-5-pyrazolone	415A
Methylcellulose	415B
N-Methylcyclohexylamine technical	415C
Oils	
Heat transfer	245
Turbine	56
Oxides	
Aluminum	247c
Boric	413A
Iron, red	302
Magnesium	247d
Molybdcic	415D
b, b'-Oxydipropionitrile	415E
Paper	142A
Papermaking, tech. bulletin 827	20-1d
Paradichlorobenzene	329d
Paraformaldehyde, bulletin W-30	233
Pentaerythritol, technical	415F
Periclase	345f
Peroxygen compounds	415G
Phenobarbital USP powder	415H
Phenols, high purity	133
Phosphates	415I
Amyl acid	BL433d
n-butyl acid	BL433e
Iso octyl acid	BL433f
Lauryl acid	BL433g
Methyl acid	BL433h
Phosphorus oxychloride	415J
Plasticizers	12c, 415K, 416A, 416B, 416C, 416D

Plastics	
Engineering	146C
Kel-F	14-5
Polyethylene package	248D
Potash, caustic	329b
Potassium m-bisulfite granular	416E
Potassium silicates	416F
Powders, diatomite	141
Preservatives	416G
Propellents	416H
Pulping, ammonium bisulphite	321
Pyridose powder	416I
Pyrrrole	416J
Resins	111, 20-1i
Aminoplastic	20-1e
Copolymer	20-1f
Synthetic	78a
Rhenium	148B
Rosin & Rosin derivatives	78e
Rubber, silicone	148E
Sequestering agents	416K, 417A
Sesquicarbonate of soda	147
Silicon carbide	247b
Soda ash	62
Soda	
Caustic	150, 329e, 417B, 417C 417D, 417E
Sodium	
Metallic	311-2a, 417F
Nitrate	140A
Sodium pentaborate	417G
Sodium m-Silicate	417H
Sodium tetraborate pentahydrate	417I
Solvents	417J, 418A
Aromatic	327a
Petroleum	253
Toluol	327b
Xylol	327c
Stabilizers, vinyl	418B
Styrene monomer	417
Sulphur dioxide	47
Liquid	R303
Tetrachloro phthalic anhydride	329g
b, b'-Thiodipropionitrile	418C
Triallyl cyanurate	20-1j
Trichlorethylene	329f
Tri-N-amyl borate	418D
Urea, crystal	341, 418E
Vaccines, dust	20-1g
Vinyl topcoats	144B
Zirconia, fused	247e
Zirconium	418F

Equipment

Absorbers, catalog S-7460	219f
Accumulators	138-9a
Adaptors, catalog TG-953	286d
Aerosol samplers	250C
Agitators, catalog 530	349a
Side drive, bulletins 531 & 532	349b
Turbine & slow speed, bulletin 76	237a
Alloys	
Copper	255
Hard-facing, manual 77	430
Stainless	351
Titanium	24-5c
Analyzers	227
Gas & liquid	93b
Oxygen-combustibles, lit. E65-1 & E12-5	50
Servo	426C
Autoclave-reactors, catalog 2413	151
Bags, multiwall	328, 409
Ball bearing units, industrial	422A
Batteries, truck	244B



platinum GOLD AND SILVER

FOR THE
CHEMICAL AND
METALLURGICAL
INDUSTRIES



PLATINUM

Salts and Solutions.
Platinum Metals Catalysts — Concentrated forms and on carriers.
Sheet, Wire, Tubing, Gauze and Fine Foils.
Electrodes, Stills, Retorts and other Special Process Equipment to order.
Laboratory Wares of all description.

Palladium, Iridium, Osmium,
Rhodium and Ruthenium.

We pay highest prices for scrap platinum and also have facilities for prompt recovery of spent platinum and palladium catalysts.

WE INVITE YOUR INQUIRIES AND WILL BE GLAD TO SEND ON REQUEST OUR FOLDER C-20, "PLATINUM, GOLD AND SILVER FOR SCIENCE, INDUSTRY AND THE ARTS."



GOLD

Sheet, Foil and Ribbon, pure and in alloy. Seamless Tubing. Laboratory Apparatus and Process Equipment.
Karat Golds. Fine Gold Anodes.



SILVER

Fine, Sterling and Coin. Sheet, Wire, Circles and Foil.
Fine Silver Anodes. Rolled, Cast or in Shot Forms.
Silver Brazing Alloys and Fluxes for every industrial requirement.

THE AMERICAN PLATINUM WORKS

PRECIOUS
METALS
SINCE
1875

231 NEW JERSEY R.R. AVE.,
NEWARK 5, N. J.

where **HARD RUBBER** is right...

use it!



CORROSIVES

...can't hurt ACE molded parts

Because ACE hard rubber is completely unaffected by most chemicals and doesn't object to water in the least, it's ideal for parts like this rayon candle filter.

One of the strongest plastics (tensile up to 10,000 psi.), ACE hard rubber is good for tough jobs, too. Easy to machine (the threads above, for example), easily polished (like your faithful ACE comb), it does a better job at lower cost in thousands of parts from bearings to magneto parts and water meter pistons. We can mold it for you, extrude plain and fancy shapes, supply sheets for punched parts, line or cover metal with it, and even make large, intricate parts by hand-wrapping.

Ask for valuable design Handbook on ACE Hard Rubber and Plastics.

American Hard Rubber Company

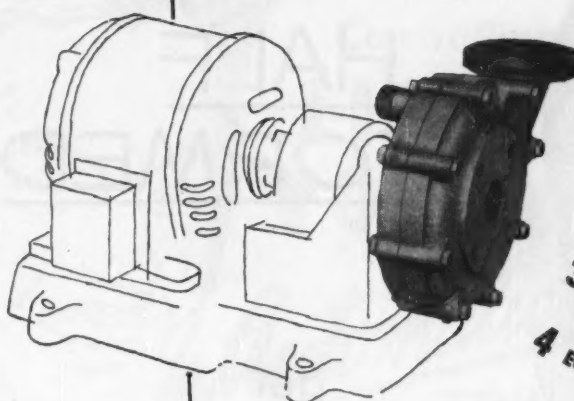
93 WORTH STREET • NEW YORK 13, N. Y.

PRODUCT INDEX . . .

Belts	
Conveyor	353
Metal	290
Rubber	224-5c
Rubber transmission	224-5d
V	49
Blenders	
Dry, bulletin 78	237g
Twin shell, catalog 13	105
Blocks, pillow	90f
Blowers, bulletin 5-154	299
Rotary positive, bulletins	
AF-154 & RB-254	427a
Blowers & exhausters, centrifugal,	
bulletin 120-B-14	427b
Boilers, catalog AD-100	43
Boosters, duct, bulletin 109-A	237f
Burners, lit. H54-16	L355
Calculators, vacuum	36b
Castings	
Centrifugal	51
High alloy	307a
Bulletin 3150-G	413
Cements	282
Centrifugals	
Continuous	205, 428A
Suspended	428B
Circuit breakers	244E
Classifiers, continuous centrifugal	428C
Cleaners, condensor	406
Clutches, cam	422B
Coatings, protective	102, 418C, 420A
Bulletin 110	411
Cocks, sleeve-packed	243d
Collars, set	90c
Collectors, cyclone	6e
Columns, distillation	320f
Comparators	R364
Compressor pump unit, bulletin	
16B8126	91
Compressors	64, 434B
Centrifugal	336
High pressure	R355
Oil free, bulletin A-44	8
Spiraxial, bulletin SC-354	427e
Concentrators, bulletin 1276	137
Condensers & reboilers	424E
Conduits, electrical	244D
Control systems, drainage, publ.	
6025	317
Controllers	
Indicating	425A
Bulletin 5A-13	54
Liquid level	101e
Pressure	101d
Controls	101a
Load cell	252C
Temperature	426A
Valve, catalog L-54	98
Conveying systems, pneumatic	67a
Conveyors	
Air	100
Belt	67c
Natural frequency, bulletin 111	259
Portable	248E
Screw	24-5b, 67b
Data book 2289	38
Sectional	248B
Steel belt	333a
Tubular, bulletin CE-255	438
Vibrating	423C
Zipper, bulletin 349	383
Coolers	249e, 424F, TR441, 444b
Cascade, catalog S-6820	219e

Continuous, steel belt, water fed . . .	333b
Rotary . . .	424G
Bulletin A-422 . . .	92b
Air, catalog A . . .	TR431
Cooling & condensing sections, bulletin CEC-54 . . .	425
Couplings . . .	90b
Flexible . . .	426D
Crushers . . .	
Gyratory, primary . . .	249d
Secondary . . .	249g
Jaw, bulletin 1124 . . .	249b
Laboratory . . .	342b
Crystallizers . . .	131c
Vacuum, bulletin C-100 . . .	7g
Cylinders . . .	BR431a
Doors, automatic . . .	300
Drives . . .	
Silent chain, book 2425 . . .	72
Variable speed . . .	79
Drum inserts . . .	248A
Drums . . .	
Acid . . .	267
Magnetic, bulletin B-601 . . .	84a
Dryers . . .	444a
Rotary, bulletin A-422 . . .	92c
Spray, bulletin D-106 . . .	7d
Drying equipment, spray, bulletin D-105 . . .	7c
Duct systems . . .	284
Dust collectors . . .	242C, BL324, 348
Centrifugal . . .	257
Cloth tube, catalog 372 . . .	318
Blow ring, bulletin 528-R . . .	239
Ejectors, steam jet . . .	89
Elbows, jacketed . . .	238B
Elevators, bucket . . .	13, 67d
Evaporators . . .	131a, 320e
Forced circulation, bulletin E-107 . . .	7b
Vertical, long tube, bulletin E-100 . . .	7a
Fabrications . . .	
Metal . . .	326, 408
Process equipment . . .	TR419, 420B
Stainless steel . . .	415
Fans . . .	352
Axial . . .	434C
Industrial, bulletin 702 . . .	58
Stack, bulletin 109-A . . .	237f
Feeders . . .	423D
Apron & grizzly . . .	249h
Chemical, bulletins 45-H8, BIF-4A . . .	88
Disc . . .	424A
Rotary airlock . . .	426
Rotary vane . . .	67e
Scale . . .	442
Filter aids . . .	331a
Filters . . .	131b, R421
Batch . . .	295b
Cartridge polishing . . .	295d
Continuous vacuum . . .	125
Dry solids, recovery . . .	295a
Filter presses . . .	432b
Plate, horizontal . . .	BL443
Pressure . . .	11
Pressure leaf . . .	429A
Catalog NC-1-53 . . .	203
Rotary vacuum . . .	429B
Sluicing . . .	295c
Top-feed, bulletin F-101 . . .	7f
Vacuum, rotary drum, bulletin F-100 . . .	7e
Fire extinguishers, dry chemical . . .	280
Fittings . . .	243a
Catalog F-9 . . .	325b
Polyethylene . . .	242A

only **1** material has all **4**



1 CORROSION RESISTANCE

2 STRENGTH

3 DIMENSIONAL STABILITY

4 ECONOMY

...for ACID PUMPS for instance

One of the strongest plastics known . . . Ace Hard Rubber . . . got the nod for the impeller and casings of this acid pump. Why? (1) It's resistant to almost all corrosives; (2) High strength and abrasion resistance; (3) Won't warp or swell; and (4) Costs much less than corrosion-resistant alloys. Typical result: On one job this hard rubber pump handles 12% hydrofluoric acid, turns on and off twice a minute, 24 hours a day, six days a week . . . a mighty tough test for corrosion-resistant materials?

Many other Ace hard rubber compounds are available . . . tensiles as high as 10,000 psi, moisture absorption as low as 0.04%, power factor as low as 0.006, heat resistance to 300 Deg. F. . . also many new plastics and rubber-resin blends. All Ace compounds are tailor-made to fit the job . . . never over-designed. That's why Ace is the *only* material that meets all four big requirements for parts like acid pumps.

and here's a **5th**

Hard rubber sleeve provides electrical insulation as well as mechanical and chemical strength in this coupling for electroplating agitator.



80-pg. Ace handbook free to design engineers.



ACE® rubber and plastic products

AMERICAN HARD RUBBER COMPANY
93 WORTH STREET • NEW YORK 13, N. Y.

don't be HALF INFORMED

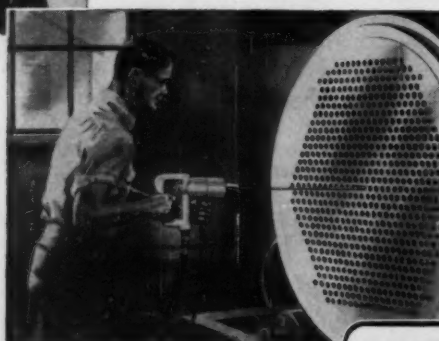
get a **DEMONSTRATION** of the **Airetool CC-4325**

Become acquainted with the remarkable results obtainable from this condenser cleaner . . . it's the lightest, most flexible and mobile condenser cleaner ever offered on the market!

Say goodbye to bulky, cumbersome condenser cleaning equipment . . . gain new speed in your operations with the feather-light new AIRETOOL CC-4325. It weighs only 11 lbs. and is easily handheld by one man, with no supporting rig required! A high-speed two-stage air motor provides extra power to rapidly and completely clean scaled tubes, even those completely plugged with hardest deposits.

The AIRETOOL No. CC-4325 Condenser Cleaner, and a carbide-tipped drill, form a combination that is really speedy and efficient. The built-in hand-controlled flushing system removes chips from the drill point as you work. A wide variety of drill and brush heads are available to meet every condenser cleaning need . . . they're quicker, safer and thorough in cleaning condenser tubes.

WRITE TODAY for complete details about the CC-4325 and other AIRETOOL Tube Cleaning and Expanding Equipment. Ask for your demonstration appointment!



Remember . . . there's an AIRETOOL Tube Cleaner and Tube Expander for Every Type of Tubular Construction.

REPRESENTATIVES in principal cities of U.S.A., Canada, Mexico, South America, England, Japan
BRANCH OFFICES: New York, Chicago, Philadelphia, Tulsa, Houston, Baton Rouge

AIRETOOL

MANUFACTURING COMPANY

SPRINGFIELD, OHIO



PRODUCT INDEX . . .

Stainless steel, catalog 1-154	82a
Catalog 52F	307b
Fittings & flanges, welding	36A-Bb
Flanges	
Catalog F-9	325c
Alloy steel	223
Coated	229
Furnaces, vacuum	424H
Gages	
Chemical	289
Liquid level	TR338
Tank	TL343
Gaskets	
Snap on, catalog TG-953	286b
Teflon	276
Jacketed, catalog TG-953	286a
Generators	L338
Gas, bulletin 1-10	306
Inert gas, bulletin 100-B-14	427g
Granulators	6d
Graphite equipment, impervious	219g
Grating & stair treads, stainless steel	420
Grinders, sample, laboratory	342d
Handling & processing, bulk materials	224-5a
Hangers, pipe, bulletin 54	298
Heat exchangers	30-1c, 320d, 454a
Catalog S-6740	219c
Catalog section S-6840	219d
Brazed aluminum	42
Heat transfer & crystallization, bulletin E-106	7i
Heaters, fired	99
Heating systems, dowtherm	129
Holdbacks	90d
Hose	
Flexible metal, bulletin 20D	269
Industrial rubber	224-5e
Humidity conditioning units, lit. K54-3	70
Impellers, pump	429
Indicators	
Dew point	R324
Level	243e
Oxygen	93a
Instrumentation, waste treatment, bulletin 7302	154-5
Insulation	
Cellular glass	48
High temperature	384
Magnesia	60
Pipe	57
Plastic finish	35
Jointings & packings, compressed asbestos sheet	243b
Joints, swing, catalog 400	439
Joints & couplings, catalog TG-953	286c
Kettles	296a
Kilns	444c
Rotary, bulletin A-422	92a
Bulletin 1115	249a
Laboratory equipment	TL433c
Laboratory & pilot plant equipment, bulletin 77-A	237b
Lathes, glass working	L419
Lead products	123
Lectrodryers	73
Lubricators, force feed	423
Magnets	84b
Plate	84c
Materials handling	22-3
Measuring systems	426B
Meters	
Flow	BR441

Industrial	83b
Liquid volume	407
Positive displacement, bulletin	
M-152	427d
Stainless steel, bulletin OG-406	83a
Mills	
Ball & pebble, bulletin 100	237h
Flaking	251b
Grinding, bulletin 8121	249c
Hammer	6f, 80a
Helix-seal	80e
Laboratory swing-sledge	342a
Roller	6c, 80b
Three stage	251a
Mixers .. 121, 201a, BR419, 430A, 4030B	
430C, 430D	
Catalog 17	85a
Bulletin 522	344
Continuous, bulletin A	237k
Fluid	201b
Laboratory, catalog DH-50	201c
Explosion-proof, catalog	
DH-51	201h
Portable, catalog 17	85c
Catalog B-108	201d
Bulletin 74-A	237j
Ribbon, bulletin 78	237g
Side entering, catalog 17	85d
Catalog B-104	201e
Bulletin 72-A	237c
Top entering, bulletin 73	237d
Propeller type, catalog B-103	201f
Turbine type, catalog 17	85e
Turbine & paddle types, catalog	
B-102	201g
Turbine	211
Mixers & Agitators	320a
Mixing & extruding machinery,	
bulletin 62-A	237e
Motor base	246C
Motor starters circuit breakers	94
Motor units, catalog 51	323
Motors	
Cast iron frame, bulletin MO-132	268
Chemical	77, 246E
D C	244C
Dynamic unibrake	453a
Electric	244A
Enclosed	246D
Low speed	246B
Magnetic unibrake	453b
Totally enclosed, fan cooled,	
bulletin 51B7149	261
Nozzles	BR338
Book N-617	162
Spray, catalog 24	BL343
Packaging, chemical	R343
Packings & gaskets, Folder PK-80A	76
Packings, teflon	428
Panels, pulsating	305
Pans	296b
Grinding & mulling, bulletin 5A	237i
Paper, autopositive	156
Pipe & fittings, catalog S-7000	219b
Pipes, welding	87
Piping	308
Power, bulletin 2443	81
Prefabricated	16
Platecoils, bulletin P61	86
Plates, stainless steel	332
Platinum, gold & silver, folder G-20	403
Polyvinyl materials	12a
Preheaters, air	157
Presses	
Filter	432a
Rotary	TL421

With NIAGARA METERS



They're
Controlling

LIQUID VOLUME

Automatically

**YOU CAN
DO IT TOO!**

- FOOD INDUSTRIES
- CHEMICAL PLANTS
- DAIRY PRODUCTS
- SYNTHETIC TEXTILES
- PETROLEUM

Imagine the time and guesswork you can save by measuring liquid volumes automatically. Just set the hand of the NIAGARA Electri-Contact METER at the volume desired and turn on the flow of liquid.

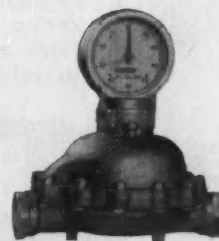
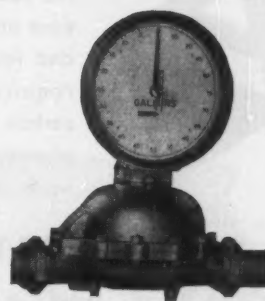
SET IT — FORGET IT

It will turn off automatically. NIAGARA METERS enable your men to handle more work.

Practically every type of industry is using and acclaiming the accuracy of NIAGARA METERS. They precisely measure liquid volumes from one to one thousand gallons a minute!

There's a NIAGARA METER for nearly every type of liquid including most chemicals. Investigate the advantages of NIAGARA METERS.

Write today for full details.



BUFFALO METER CO.

2891 MAIN STREET

BUFFALO, NEW YORK

E. Goodrich

Swift & Comp.

Eastman



These Well-Known Companies

**Know BOARDMAN For
Quality Metal Fabricating**

When companies of the calibre of those named here—representing only a partial list of BOARDMAN customers—select the same firm for their varied metal fabricating needs, it means just one thing:

In the quality of its workmanship and the character of its service, BOARDMAN delivers the goods!

Let BOARDMAN prove to you that it has the facilities, the personnel, the experience and skill needed to design, engineer and fabricate for your metal products requirements—whether they involve carbon steel, stainless steel, clad steels, aluminum or wrought iron. BOARDMAN works with them all!

THE BOARDMAN CHALLENGE

With absolutely no obligation on your part, our Chief Engineer will fly to your plant for on-the-spot consultation regarding your particular metal fabrication problems. For literature, quotations or immediate action, write, wire or telephone TODAY.

THE BOARDMAN Co.

OKLAHOMA CITY, OKLAHOMA
P.O. BOX 1152 • PHONE L.D. 234

METAL FABRICATING SPECIALISTS FOR MORE THAN 40 YEARS

PRESSURE VESSELS INCLUDING A.S.M.E. CODE VESSELS • BATCHERS • BINS • BURNERS
COLLECTORS • CONVEYORS • DRYERS • DUCTS • ELEVATORS • FANS • FEEDERS • FLUES
GRADING EQUIPMENT • HOPPERS • MIXERS • STACKS • STERILIZERS • TANKS • WASHERS

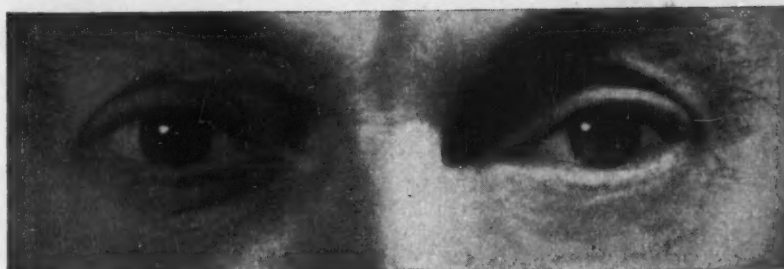
PRODUCT INDEX . . .

→ Want more information on any of these items? Just circle its code number on the postcard inside the back cover, then mail to us. It's that easy now.

Processing equipment . . .	224-5b, TL433b
Bulletin AH-348-11 . . .	444d
Propellers . . .	BR310
Pulverizers . . .	6a, 330
Swing hammers . . .	278
Pumps	
Bulletin 30C . . .	315
Bulletin 976 & 982 . . .	L364d
Acid . . .	215
Boiler feed, bulletin 980 . . .	L364b
Canned rotor type, bulletin 1010 . . .	208-9
Centrifugal . . .	69, 75
Catalog 253 . . .	82b
Catalog S-7250 . . .	219a
Bulletin 720.4 . . .	418
Chemical . . .	242B, TL443
Bulletin S-1254 . . .	L310
Double suction, bulletin 955-Q . . .	L364a
Gas, Bulletins 31-B-17 & 32-33-B-13 . . .	427c
High vacuum, catalog 700 . . .	36a
Paper stock, bulletin 953 . . .	L364c
Process, bulletin 1125-B . . .	153
Rotary . . .	TL324
Bulletin S-206 . . .	440
Slurry, bulletin 181 . . .	288
Slurry & sludge, bulletin 206-4 . . .	422
Solids handling . . .	236A
Stuffing box, bulletin S-147 . . .	L303
Vacuum . . .	435A
Bulletin 755 . . .	36c
Bulletin 50-B-13 . . .	427f
Vertical sump, bulletin 4600-A . . .	414
Vertical turbine . . .	63c
Reactors & process units . . .	320c
Reclaimers, oil, bulletin R-160 . . .	281
Reclamation systems . . .	TL433a
Recorders & Controllers, type H . . .	17
Recorders, strip chart . . .	252A
Recovery systems, acid . . .	454b
Reducers, speed . . .	28-9
Refractory bricks . . .	345b
Refractory grain . . .	247a
Refrigeration . . .	435
Regulators	
Relay . . .	101f
Supply . . .	101c
Retorts, rotary, bulletin A-422 . . .	92d
Rings & seals . . .	243f
Rolls, crushing, laboratory . . .	342c
Rotors, compressor . . .	24-5d
Rubber & latex . . .	12b
Rubber products, molded . . .	224-5f
Samplers . . .	432A
Scales, checkweight . . .	424B
Screens	
Electronic . . .	250A
Vibrating . . .	80d
Scrubbers, turbine . . .	240A
Seals	
Mechanical . . .	246A
Catalog 455-CE . . .	BL421

Shaft, bulletin MS-954.....	294
Separators	
Air	80c
Centrifugal	434A
Line	283
Liquid, bulletins SC-1044 & S-1010	68
Sifters	
Circle	251c
Gyrator	6b
Silos	231
Slakers	249f
Spectrometers, mass, bulletin	
CEC1824A-X12	292
Stainless steel equipment.....	32-3
Starters, bulletin 14B6410B.....	271
Steels	158, 420C
Alloy	53
Stainless	45, 420D, 420E
Stirrers, laboratory, catalog 17.....	85b
Switches, pressure, data sheets	
920-25	285
Takeups	90e
Tank cars, flued dome.....	149
Tanks	296c, BR431b
Flat bottom	131f
Storage	59
Weigh, clad steel.....	340
Tanks & pressure vessels.....	320b
Tees, welding	10, 36A-Ba
Telemeter system	252B
Thermometers	44
Towers	BR431c
Cooling	9
Processing	131d
Stainless steel, bulletin 550.....	322a
Tractor shovels	37, 97, 216-7, 248C
Transmission parts, conveyor.....	90a
Transmission, variable speed.....	423A
Traps	
Pipeline	84d
Steam, catalog 953.....	127
Treads, stair, bulletin 2365-R.....	293
Trucks	
Drum	424C
Industrial	424D
Tubes	
Copper	39
Water	350
Tubing	
Alloy	291
Welded	316
Tubing & Pipe, stainless steel.....	24-5a
Turbines, steam, bulletin 135.....	52
Vacuum equipment	263
Valve & fittings, polyvinyl chloride..	40-1
Valves	30-1b, 424b, 427A, 427B
Catalog AD2059	277a
Catalog F-9	325a
Angle, catalog AD2059.....	277d
Butterfly	287
Check, bulletin H-1, H-2.....	61a

Want Proof?



then trust your own eyes!

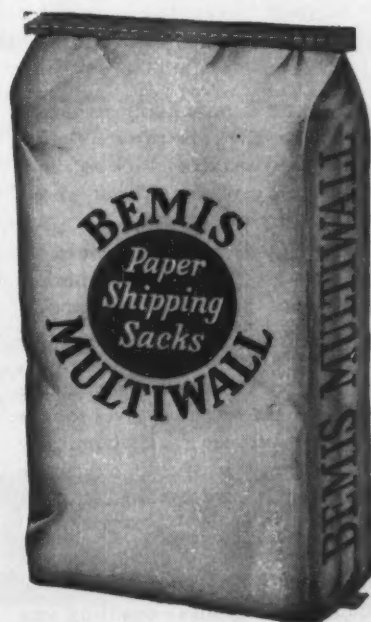
And you will know that Bemis color printing of brands on multiwall paper bags is bright, crisp, color-true . . . the kind that will boost the selling power of *your* brand.

Ask your Bemis Man to show you typical Bemis multiwall printing. Trust your own eyes.

Bemis



General Offices—St. Louis 2, Mo.
Sales Offices in Principal Cities





So pure it's used to filter food products

SOLKA-FLOC®

99.5% Chemically Pure Cellulose

SOLKA-FLOC is now being used as a filter-aid for a rapidly growing number of food products—proof that SOLKA-FLOC gives the clearest, purest filtrate at high flow rates.

The finely-divided cellulose particles of SOLKA-FLOC form the perfect filter barrier—trapping even the tiniest of suspended solids. SOLKA-FLOC can be handled readily with a knife, will not gouge... gives a more stable cake, will not bleed... gives longer life to the precoat... is chemically inert... easily washable... can be burned to recover any valuable solids remaining.

To meet your specific requirements, SOLKA-FLOC is available in a wide range of grades—enabling you

to obtain any desired combination of flow rates and efficiency of filtration.

For better quality foods through better filtration use SOLKA-FLOC. Write to our Technical Service Department FD-2, in Boston, describing your problem in detail.

BROWN



COMPANY, Berlin, New Hampshire
CORPORATION, La Tuque, Quebec

General Sales Offices:
150 Causeway Street, Boston 14, Mass.
Dominion Square Building, Montreal, Quebec

Mexico City
Commercial Tropical
S. A.
Calle de Elba #32
Mexico, D. F.

London, England
Johnsen, Jorgensen
& Wettre, Ltd.
26, Farringdon St.
London, E. C. 4.

PRODUCT INDEX . . .

Corrosion resistant	213
Diaphragm	238A, 416
Diaphragm control	101b
Gate, catalog AD2059	277b
Cylinder operated	335
Globe, bulletin H-1, H-2	61b
Catalog AD2059	277c
Iron body, wedge gate	95
Lubricated plug	234-5
Molded diaphragm, bulletin CV53	46
Piston, seatless	243c
Porcelain	96
PVC	242D
Safety relief, catalog 48Ra & manual 51B	30-1a
Solenoid, bulletin W-7	L431
Vessels	
Mixing, high pressure, bulletin 550	322b
Pressure	131e, 138-9b
Vibrators	L441
Concrete	437
Viscometers	250B, TR310
Washers	
Pulp, bulletin E-108	7h
Screw	304
Water treatment, demineralizers	R443
Wattage control	423B
Weldments	424a
Wells, water	63b
Wires, thermocouple, bulletin 31-300 E.	434

Services

Chemical cleaning	71
Design & construction	270
Processing plants	2
Engineering & construction	34, 117
Petroleum & chemical industry	115
Engineering & design	320g
Fire protection	346
Plants	
Fertilizer	65
Water treating	309
Water treatment	63a

Building up files?

Then you can cash in right now on our new, comprehensive Guide to Technical Literature in this issue. There you'll find a checklist of the current and latest literature on any topic in your field—easy to get, too.

Flashback

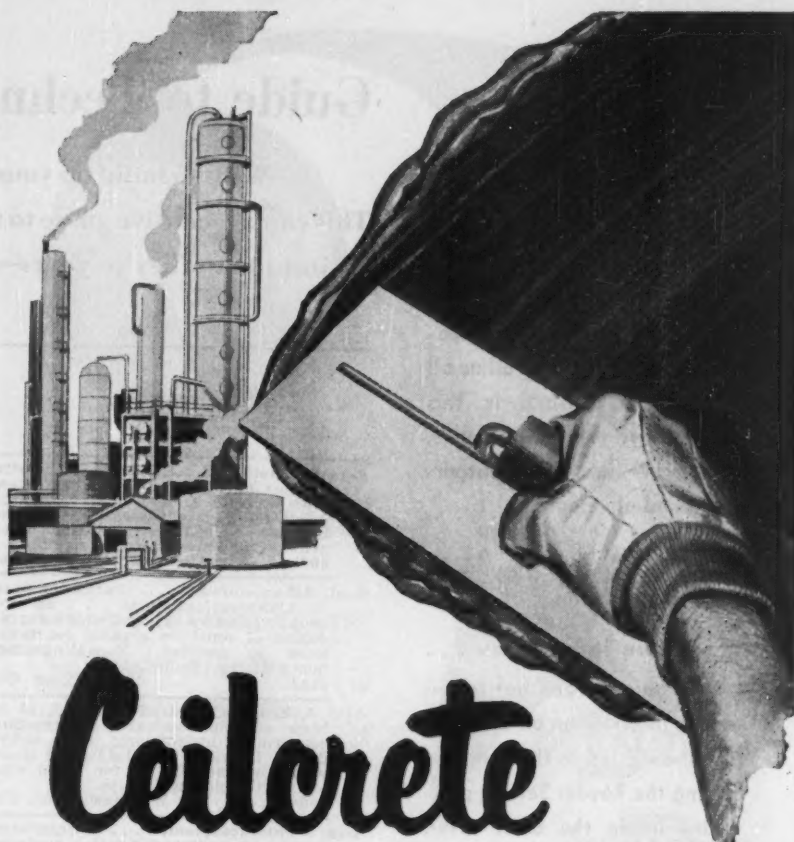
To make sure that you don't miss any news that could help you with your job, Chemical Engineering is doing a double take for you. The index below repeats the editorial listings only on chemicals, equipment and services featured last month in New Equipment and New Products. Use the postcard (p. 445) for more information on any items.

Chemicals

Acid, lipergic	144I
Sorbic	144I
Adhesives, teflon	144D
Adsorbents, selective	136A
Amel	144A
Coagulents	142A
Emulsifiers, pesticide	144E
Greases, water and heat proof	144J
Laminates	144G
Molding compounds	144B
Nylon powders	144F
m-Phenols	144C
Resins, polyester	262D
Rubber, fibrous	140A
Silicone powder	140B
Stabilizers, mud	142B

Equipment

Boiler compounds	256F
Castings, stainless steel	262C
Chillers, liquid	256C
Classifiers, continuous centrifugal	258B
Compressors, two-in-one	252A
Controllers	260B
Crushers	258D
Cyclone, ceramic	258A
Dryer, drum	256D
Fittings, jacketed cross	254B
Generators, steam	256B
Heating elements	
Resistance	256E
Hose, flexible	254E
Lining systems	262B
Measuring systems	260C
Solids	258C
Pumps	
Submersible well	254A
Turbo	254D
Siphons, jet	254C
Sprayers, hot	264C
Thermocouple	260A
Thread compounds	264B
Transmissions, ball	248A
Transmitter, pressure	260C
Traps, steam	256A
Tube removal	264A
Vermiculite concrete	262A
Welding, arc	264D



Ceilcrete

a stonelike acidproof coating for floors, walls, tanks, trenches
... provides superior protection for concrete surfaces

CEILCRETE is chemically equal to acidproof brick in many applications ... yet it can be applied at a fraction of the cost and in far less time! It can be troweled on all types of concrete surfaces: flooring ... pipe, tank and trench lining ... walls ... cement block ... pump bases ... waste disposal systems.

A thin coating of CEILCRETE withstands trucking, foot traffic and erosion from hot solutions and steam. Floors covered with CEILCRETE have load carrying capacity four times greater than plain concrete! Surface is nonslip, and CEILCRETE "B" has the added feature of being sparkproof.

Only CEILCRETE has maximum resistance to acids, alkalis and solvents as well as to abrasion and heat. It adds no weight to floors and does not noticeably raise the elevation.

CEILCRETE materials can be supplied ready for installation, or a complete job can be done on a contract basis. Available in black and colors.

For complete details
and specifications, write
today for Bulletin 110.



1959-CO



THE CEILCOTE COMPANY
CORROSIONPROOF MATERIAL AND CONSTRUCTION

4836 RIDGE ROAD

CLEVELAND, OHIO

What It Contains . . .

This is a comprehensive listing of the latest literature you can now get from manufacturers on chemicals, equipment and services in all fields of interest to chemical engineers. It lists new publications just issued as well as all bulletins mentioned in this issue. For your convenience, all items have been categorized and alphabetized.

For More Information . . .

You can get—and get fast—more information on any publication listed in this guide by using the Reader Service postcard inside the back cover. Simply circle the item's code number on the postcard, fill in your name and address, then mail to us. Ask for as many as you need. Answers come to you direct from the companies putting out the literature.

Contents of This Issue . . .

Chemicals and materials	412
Construction materials	418
Electrical equipment	422
Handling and packaging	423
Heating and cooling	424
Instruments and controls	425
Mechanical equipment	422
Pipe, fittings, valves	426
Process equipment	428
Pumps, blowers, compressors	434

Guide to Technical Literature

Want to build up your files and keep them up-to-date? This comprehensive guide to available literature will help you do just that. They're yours—free—for the asking.

Chemicals

- Acetazolesamide**.....Relieve edema with Diamox acetazolesamide Lederle—new oral diuretic & acid-base regulator which inhibits enzyme carbonic anhydrase, & reduces acidification of urine. Complete information. 20-1a American Cyanamid Co.
- Acid, Alkanesulfonic**.....Furnishes data on alkanesulfonic acid . . . an unusually effective catalyst where degradation of sensitive organic reactants must be avoided. Nonsulfonating, nonoxidizing. Bulletin 11. 412A Indoil Chem. Co.
- Acid Anhydrous, Hydrofluoric**.....40 p. book contains valuable information concerning hydrofluoric acid anhydrous. Provides useful data for those who now use HF, or for those who are contemplating its use. 266a Harshaw Chem. Co.
- Acid, b-Chloropropionic**.....Suggested uses: intermediate for resins, surface-active agents, herbicides and diverse synthetic organic chemicals. Request company's Technical Data Sheet for further information. 412B Monsanto Chem. Co.
- Acid, Citric**.....Important chemical in many metal cleaning pastes & liquid formulations for both home & industrial use. Data in "Ammonium Citrate & Citric Acid in Scale & Rust Removal," Bulletin No. 15. 265a Chas. Pfizer & Co.
- Acid, Hydrobromic**.....Bromide intermediates made with hydrobromic acid often provide a higher yield of finished products and more economical production. Request complete information and detailed Catalog. 412C Michigan Chem. Corp.
- Acid, Oleic**.....Truly sulfonated oleic acid gaining wide acceptance. Its stability & effectiveness, particularly in low pH ranges, have opened many new fields of application. Provides samples & literature. 412D Tennessee Corp.
- Acid, Oxalic**.....Because Pfizer oxalic acid solubilizes iron oxide, it is chief ingredient in radiator cleaning compounds. Company makes available complete information in detailed Technical Bulletin No. 34. 265b Chas. Pfizer & Co.
- Acid, Pelargonic**.....Emfac pelargonic acid improves high-bake enamels four ways. Furnishes a product sample, Technical Bulletin, and descriptive literature on the use of pelargonic in high-baked enamels. 412E Emery Industries
- Acid, Peracetic**.....Peracetic acid 40%, a new germicide-fungicide for the food industry—covers general & germicidal properties & use for germicidal washes for produce & processing equipment. Bulletin No. 15. 412F Buffalo Electro-Chem. Co.
- Acid, Phenylacetic**.....Suggested uses: an intermediate for drugs (antispasmodics, sedatives, antiseptics, and anticoagulants); perfume aromatics; insect repellents; etc. Details in valuable Technical Bulletin. 412G Kay-Fries Chem.

Acid Phosphates, Alkyl.....Available in quantities ranging from experimental to semi-commercial—methyl acid phosphate—n-Butyl acid phosphate—amyl acid phosphate—iso octyl acid phosphate—etc. Data & samples. BL433a Oldbury Electro-Chem. Co.

Alcohol, Tetrahydrofurfuryl.....THFA is a convenient starting point for preparation of high boiling esters & ethers where its function is that of a primary alcohol. Offers Bulletin 87 C plus a product sample. 297 Quaker Oats Co.

Alcohols.....52 p. includes valuable data on 20 alcohols sold in commercial quantities. Covers uses & suggested applications, properties, shipping, test methods, etc. Photographs and charts. Book No. F-4731. 143a Carbide & Carbon Chem.

Alcohols, Fatty.....Presents booklet, "Possibilities," which sums up over 25 years of working research—tells you how to use vacuum-distilled NE, USP, or technical grades of cetyl, oleyl, and stearyl alcohols. 412H M. Michel & Co.

Aluminum Stearate Technical D Powder.....Soluble or dispersible in a wide variety of organic media, used as a gelling agent for lubricating greases & thickened oils. Details in Technical Information Sheet. 412I Mallinckrodt Chem. Wks.

Ammonia.....50 p. reference covers the technical aspects of handling, physical properties, and allied topics. Concerned with both anhydrous and aqua ammonia. Included are numerous drawings, charts, graphs, etc. 412J Spencer Chem. Co.

Ammonia, Anhydrous.....Versatile as raw material & in processing operations. CSC anhydrous ammonia, technical & refrigeration grades, is being used in numerous fields. Latest Technical Data Sheet & 48 p. Bulletin. 412K Commercial Solvents Corp.

Ammonium Oxalate.....B&A purified ammonium oxalate preferred by blueprint and diazo whiteprint paper manufacturers. It is very low in iron, heavy metals and other undesirable impurities. Samples and Data Sheet. 412L Baker & Adamson.

Ammonium Pentaborate.....Principle uses are: as a component of electrolytes for electrolytic condensers; an ingredient in fireproofing formulas; in the coating of paper. Full data in Technical Bulletin No. 5. 412M Pacific Coast Borax Co.

Antioxidants.....Cyanamid's new Antioxidant 425.....no win full commercial production.....gives rubber the highest resistance to discoloration yet attainable. Makes available complete product data. 20-1b American Cyanamid Co.

Benzene Phosphorus Oxydichloride.....Suggested uses: as an intermediate for synthesis of plasticizers and oil additives, and in general organic synthesis. Company announces the availability of product sample. 412N Victor Chem. Wks.

Benzenes, Chlorinated.....Presents a 16 p. Technical Handbook describing chlorinated benzenes. Includes derivative charts, end uses, property and solubility tables and toxicity and handling precautions. 412O Dow Chem. Co.

Boric Oxide. Investigate the potential uses of Troma anhydrous boric acid. This boric oxide flake of highest purity has many possible commercial applications. Offers experimental sample upon request.

413A American Potash & Chem.

Carbon, Activated. Each grade engineered to application with a special combination of properties: right size & shape; active surface area; adsorptive & catalytic capacity; ash content; etc. Form 4712.

413B Carbide & Carbon Chem.

Carbonates, Glycol. Ethylene carbonate & propylene carbonate fully described in new reference. Data given on physical, chemical & physiological properties, shipping container contents, etc. Bulletin F-3207.

413C Carbide & Carbon Chem.

Catalysts. Aerocat Triple A high alumina catalyst valuable in fluid cracking for the petroleum industry. Maintains 15-25% higher equilibrium activity than regular 13% alumina catalyst. Complete information.

20-1e American Cyanamid Co.

Catalysts, Specialty. Most active & stable catalysts made . . . for hydrogen production (by methane-steam reforming, by water-gas shift reaction) . . . for ammonia synthesis. Offers a valuable new Booklet.

413D American Cyanamid Co.

Chemicals. Company announces the availability of their new complete catalogue describing such products as: acetoneglycerin, p-Acetylbenzoic acid, acetylcholine iodide, acetyl phosphate, aleuritic acid, etc.

413E Bios Labs.

Chemicals, Industrial. Information on Midland custom chemicals—Dextran resins alkyd resins, polyester styrene resins, polyester pyridine resins, wrinkle & hammer vehicles, etc. 6 p. Bulletin No. MID-10.

413F Midland Chem. Corp.

Chemicals, Organic. Company makes available valuable and informative literature . . . a new catalog which describes some 3500 Eastman organic chemicals. Request your copy of important reference—List No. 39.

413G Distillation Products Ind.

Chemicals, Peroxygen. Modification methods based on the use of hydrogen peroxide, peracetic acid, and persulfates are described in detail. Also contains numerous literature references.

Bulletin No. 27.

413H Buffalo Electro-Chem. Co.

Chemicals, Process. Valuable letter-size Folder keeps process chemical information handy. Contains availability charts of light metal compounds, heavy metal compounds, acids, etc. & full price schedules.

26-7a J. T. Baker Chem. Co.

Chemicals, Synthetic. New 1955 Bulletin lists the properties, reactions and uses of company's line of synthetic organic chemicals. Covers antioxidants, styrene monomer, divinylbenzene, polystyrene, etc.

413I Koppers Co.

Chloropropionitrile. Technical data Sheet offers pertinent information: appearance and color; nature of impurities; stability; solubility in common solvents; toxicity; chemical properties; uses; etc.

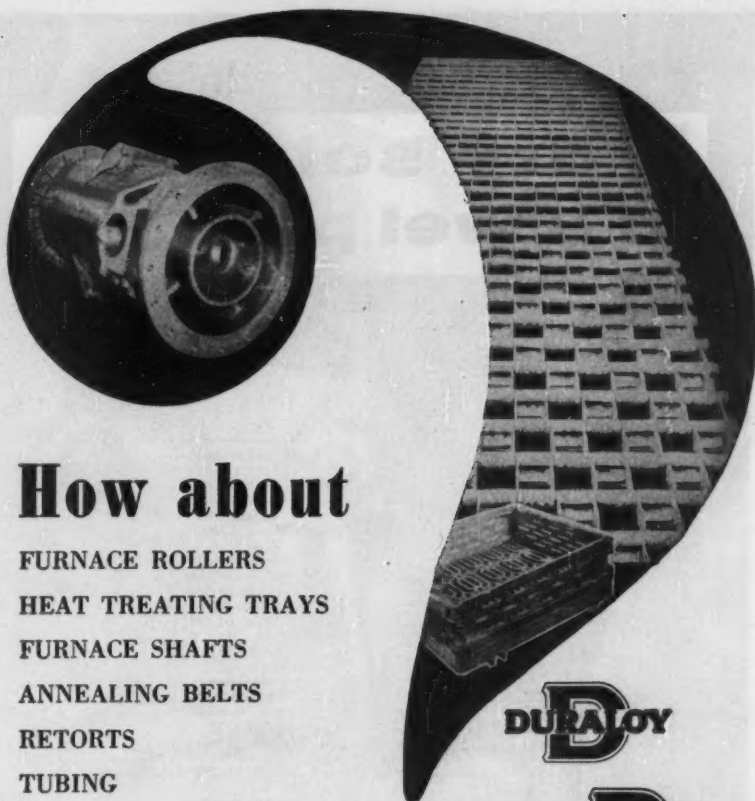
413J Monsanto Chem. Co.

Defoamers. For more efficient foam control. Versatile defoamers save space now wasted on foam, cut the processing time, eliminate waste & fire hazard of overflowing foam, etc. Offers complete data & samples.

R433 Dow Corning Corp.

Dimethylhydrazine. A colorless, flammable liquid with an ammonia-like odor, is readily soluble in water, alcohol, ether and aliphatic hydrocarbons. Information in Technical Data Sheet and price schedule.

413K Westvaco Chlor-Alkali Div.



How about

FURNACE ROLLERS

HEAT TREATING TRAYS

FURNACE SHAFTS

ANNEALING BELTS

RETORTS

TUBING

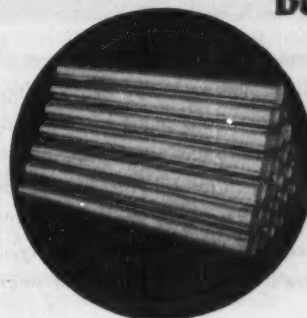
DURALOY

DURASPUN

Which are
Heat Resistant

Corrosion Resistant

Abrasion Resistant



When ready to order, how about checking with us here at **DURALOY**? For more than thirty years we have specialized in high-alloy castings. In fact, we were among the first to produce static castings and the first to produce centrifugal castings. We are old hands at producing castings alloyed to fit each specific requirement and to finish them to any extent desired.

Melt, castings and finishing are carefully controlled and quality tested by our staff of metallurgists, chemists, X-ray and gamma-ray technicians. If you would like more preliminary information, send for Bulletin No. 3150-G.

THE DURALOY COMPANY

Office and Plant: Scottdale, Pa. • Eastern Office: 12 East 41st Street, New York 17, N.Y.

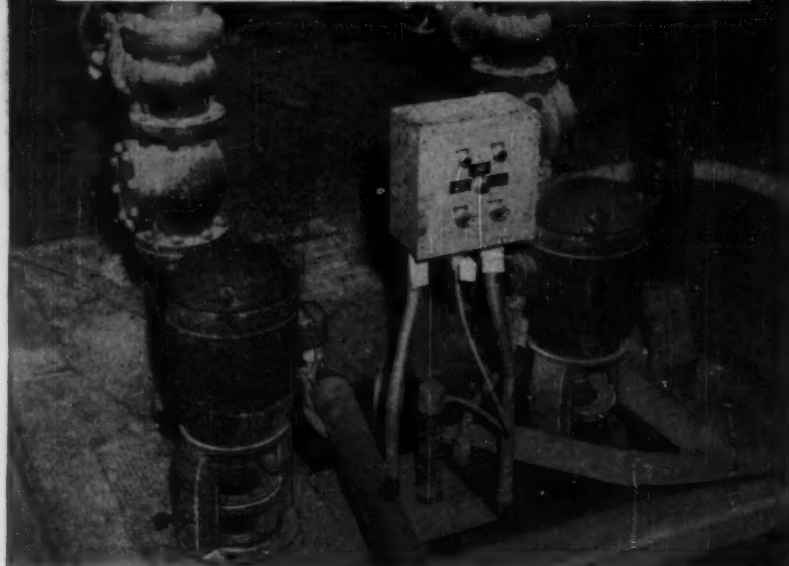
Detroit Office: 1000 W. Woodward Avenue • Boston Office: 1000

Avenue • Chicago Office: 1000 W. Madison Avenue

St. Louis Office: 1000 N. 7th Street • Kansas City Office: 1000

METAL GOODS CORP. • Dallas • Denver • Houston • New Orleans • St. Paul • Tulsa

a dry solution- to a wet problem

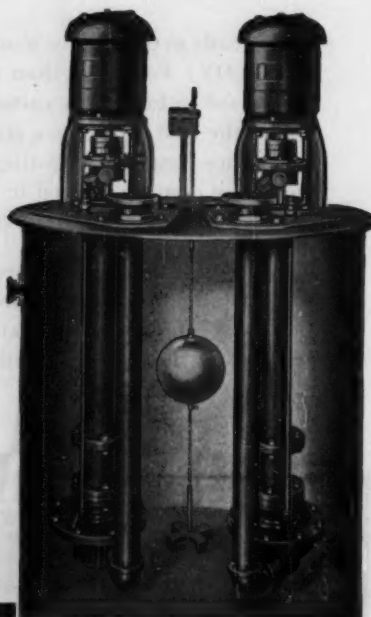
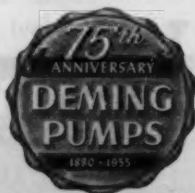


A large-volume user of water had a "wet plant problem." The solution is pictured above. Here you see two Deming Vertical Sump Pumps each with a 10 HP motor. Each pump has a rated capacity of 500 GPM with a 50-foot head. Unwanted water from all areas of the plant drains into a pit. When water in the pit rises to a predetermined level, one of the Deming Sump Pumps goes into action automatically. Or, if required, both pumps can be used simultaneously. If you have a "wet plant problem" there's a Deming Distributor near you to help you solve it.

DUPLEX UNITS

Where conditions require two pumps to operate separately, in sequence, or simultaneously, Deming Vertical Sump Pumps can be furnished as Duplex Units. The complete line includes a wide range of single and duplex units to meet most sump pump requirements. Write for illustrated BULLETIN 4600-A.

THE DEMING COMPANY
525 BROADWAY • SALEM, OHIO



LITERATURE . . .

- Dodecenylsuccinic Anhydride** 6 p.
covers physical properties, chemical properties, suggested uses, hazards, physiological action & availability. Also contains graphs and bibliography. Technical Bulletin No. 1-8.
414A National Aniline Div.
- Dyeing Synthetic Fibers** Offers valuable reference, "Dyeing Synthetic Fibers"—a comprehensive, detailed analysis of the methods & materials available for dyeing synthetic fibers. 60 p. Brochure No. GS-66.
414B General Dyestuff Co.
- Ether Anhydrous AE** Perfectly clear colorless liquid; clean characteristic odor of ethyl ether, free from foreign odor. Purest diethyl ether commercially available. Details in Technical Information Sheet.
414C Mallinckrodt Chem. Wks.
- Glycerine** Offers valuable booklets including "Glycerine—Preferred for Product Conditioning," which outlines properties that make glycerine preferable in conditioning toilet goods and pharmaceuticals.
241 Glycerine Producers' Assoc.
- Glycols** Versatile, high purity ethylene glycol & diethylene glycol for polyesters . . . antifreeze . . . alkyd resins . . . humectants . . . etc. Offers 33 p. Technical Bulletin & valuable product samples.
414D Allied Chem. & Dye Corp.
- Hydrogen Peroxide** Furnishes a general outline of properties and behavior of hydrogen peroxide solutions of over 50% concentration. Contains information on handling, construction materials, etc. Bulletin No. 46.
414E Buffalo Electro-Chem. Co.
- 12-Hydroxystearin** Presents technical data on Castorwax 12-hydroxystearin. Gives valuable explanation on where and why low-cost Castorwax is used. Includes formulation information. Technical Bulletin No. 7.
414F Baker Castor Oil Co.
- Iron Oxides, Red** Compared with other standard Copperas Reds. "100" series is: brighter in color; finer in particle size; lower in oil absorption; higher in purity; etc. Offers product samples and details.
302 C. K. Williams & Co.
- Isobutyraldehyde** A versatile chemical whose usefulness as a raw material or intermediate makes possible many interesting processing shortcuts. Sample quantities and specifications are made available.
414G Eastman Chem. Products.
- Maleic Anhydride** Plant now produces maleic anhydride in improved tablet form that resists degradation, in handling and minimizes fines. Company furnishes product samples, technical information and price data.
414H National Aniline Div.
- Maleic Anhydride** Numerous profit-making products are made possible by the reactivity, purity and color of this material. Company makes available a Technical Data Bulletin with full details of Aero brand.
414I American Cyanamid Co.
- Maleic Anhydride** The use of maleic anhydride in phthalic-type alkyd resins, in the upgrading of drying oils and in the formation of hard resins and tall oil resins, is described in illustrated, 20 p.
414J Monsanto Chem. Co.
- Methanol** Presents a detailed, 16 p. Booklet on synthetic methanol. Valuable information on uses, physical properties, shipping data, specifications, and constant-boiling mixtures. Booklet No. F-8141.
414K Carbide & Carbon Chem.
- 2-Methyl 5-Ethyl Pyridine** Company supplies product samples and detailed information on 2-methyl 5-ethyl pyridine—intermediate for nicotinic acid . . . reaction medium . . . acid acceptor . . . etc.
414L Carbide & Carbon Chem.

3-Methyl-1-Phenyl-5-Pyrazolone
An important chemical intermediate to manufacturers of pyrazolone type dye-stuffs—also in preparation of fine pharmaceuticals. Makes available an experimental product sample.
415A Dow Chem. Co.

Methylcellulose Widest viscosity range of any gum offered—nine different viscosity types—makes thickening with Dow methylcellulose more efficient and economical. Experimental sample and data on request.
415B Dow Chem. Co.

N-Methylcyclohexylamine Technical
A water-white liquid with a specific gravity of 0.86 at 20°C. It is soluble in both alcohol and ether but only slightly soluble in water. Offers fully detailed information.
415C E. I. du Pont de Nemours.

Molybdenic Oxide Presents the more important physical & chemical properties. References given to principal works on chemistry of molybdenum & to original articles containing extensive data. Bulletin Cdb-1.
415D Climax Molybdenum Co.

Oils, Heat Transfer If your heat transfer requirements go up to 600° F., you will find that S/V Heat Transfer Oil 600 is the best medium you can use. Bulletin offers complete information on benefits.
245 Socony-Vacuum Oil Co.

b,b'-Oxydipropionitrile Technical Data Sheet available containing information regarding appearance & color, stability, solubility, chemical properties & uses, toxicity & safe handling instructions, etc.
415E Monsanto Chem. Co.

Papermaking Laboratory method developed to produce two-sidedness accurately in sample papers. Used to develop color formulations which give minimum two-sidedness on mill-run sheet. Technical Bulletin 827.
20-1d American Cyanamid Co.

Paraformaldehyde For high solids resins its Celanese paraformaldehyde. Reference describes the benefits of short cut to lower costs and greater resin production. Find complete data in Technical Bulletin N-30.
233 Celanese Corp. of America.

Pentaerythritol, Technical Utilize Pentek pentaerythritol, technical . . . the polyol which has long served as the standard for top performance in the resin & paint fields. Samples & technical information.
415F Heyden Chem. Corp.

Peroxygen Compounds Uses of peroxygen compounds for bleaching, fulling, shrink-proofing and dyeing of wool are discussed on the basis of a large number of literature references. Find data in Bulletin No. 35.
415G Buffalo Electro-Chem. Co.

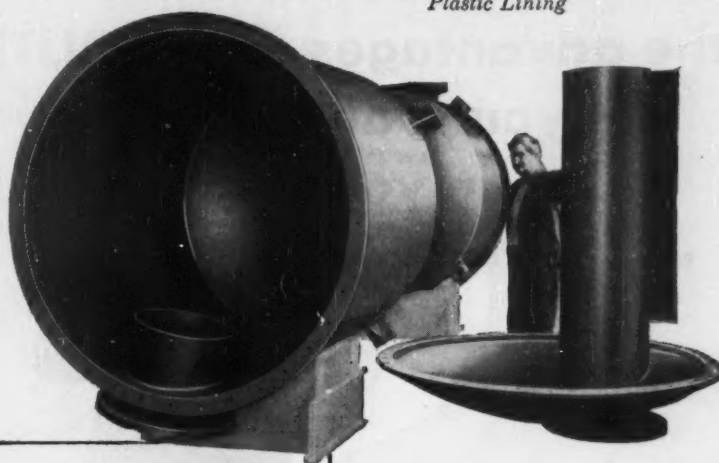
Phenobarbital USP Powder An odorless, white powder having a somewhat bitter taste. Uses—a sedative, hypnotic and antispasmodic in human and animal treatment. Full details in Technical Information Sheet.
415H Mallinckrodt Chem. Wks.

Phosphates Maas TSP, the versatile phosphate, has many uses besides its detergent & soap applications—helps make better adhesives for plywood industry, makes cutting oil emulsions better, etc. Data in Folder.
415I A. R. Maas Chem. Co.

Phosphorus Oxychloride Water-white to slightly yellow liquid. It decomposes in water to yield phosphoric & hydrochloric acids, & is chemically very reactive. Company makes available valuable product sample.
415J Victor Chem. Wks.

Plasticizers Cures at lower temperatures—cuts processing time. Offers complete details on the many advantages of Tennessee's new plasticizers . . . Benzoflex 9-88 and 2-45 for your vinyl formulations.
415K Tennessee Products & Chem.

*Pulp Tank
prepared for
Plastic Lining*



KIRK AND BLUM

offers
specialized experience in
**STAINLESS STEEL
FABRICATION**

Stainless fabrication is distinctively different from conventional steel working. The Kirk & Blum organization has the special knowledge and technique required . . . and the experience and necessary equipment for this highly specialized type of work. With 47 years of experience in sheet metal fabricating, Kirk and Blum offers quality workmanship, economical fabrication to the most exacting specifications . . . in large or small quantities.

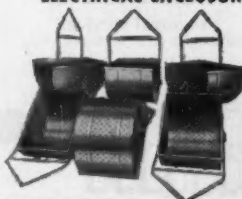
Complete facilities to ¼" capacity for: square or rotary shearing; braking, forming, rolling; punching, riveting, drilling; arc, spot and seam welding; inert gas and submerged arc welding; grinding and finishing. For prompt quotation, send prints and details.

THE KIRK & BLUM MANUFACTURING CO.
3208 FORRER STREET
CINCINNATI 9, OHIO

Literature on request:

**"SHEET and PLATE
FABRICATION"**

"ELECTRICAL ENCLOSURES"



KIRK AND BLUM

METAL FABRICATION

We Bring Your Prints to Life

Now you can have the advantages of USCOLITE* in your valves as well as in your piping



*Uscolite is a registered trade mark of United States Rubber Company.

DESIGN DETAILS

- Working parts isolated from flow.
- No packing.
- Leaktight under pressure or vacuum.
- Simple pinch clamp closure principle.
- Minimum maintenance even in the severest service.

Developed to supplement Uscolite* pipe and fittings, the new Uscolite bodied Hills-McCanna Diaphragm valve, now makes it possible to utilize Uscolite's advantages throughout your piping layout. The unique Saunders patent design of the valve coupled with the chemical resistance of Uscolite makes the valve ideal for plating, water treatment, and in the manufacture of fertilizer, bleach, storage batteries, pulp and paper, etc.

The Hills-McCanna Uscolite bodied valve is available in standard sizes from 1/2" through 2". It is suitable for pressures to 150 psi and for temperatures to 170° F. (at some sacrifice of pressure rating in larger sizes).

Write for details. HILLS-McCANNNA CO.
2341 W. Nelson St., Chicago 18, Ill.

HILLS-McCANNNA

saunders patent diaphragm valves

Also manufacturers of
Chemical Proportioning Pumps • Force-Feed Lubricators
Magnesium Alloy Sand Castings

LITERATURE . . .

Plasticizers Describes 3 high quality plasticizers—Good-rite GP 261; Good-rite GP 233; Hycar Nitrile Rubber. Manufactured to meet rigid specifications of high & consistent quality. Service Bulletin GP-5.
416A B. F. Goodrich Chem. Co.

Plasticizers Most versatile low temperature plasticizers available—excellent heat and light stability; outstanding low temperature flexibility; unusually low volatility; etc. New Plasticizer Booklet.
416B Emery Industries.

Plasticizers Outstanding because of their low volatility, their excellent electrical properties, & the improved low-temperature properties they impart to vinyls. Data & samples of Plasticizers 810 & 812.
416C Carbide & Carbon Chem.

Plasticizers Provides technical and comparative data covering: di octyl phthalate-HR; iso octyl-iso decyl phthalate; di iso decyl phthalate; di iso octyl adipate; di iso decyl adipate; di octyl sebacate.
416D Dewey & Almy Chem. Co.

Potassium m-Bisulfite Granular White, free-flowing crystalline granules; slight odor of sulfur dioxide. Widely used in food and beverage industry. Details in company's Technical Information Sheet.
416E Mallinckrodt Chem. Wks.

Potassium Silicates Kaoli potassium silicates are useful because of the wide range of physical and chemical properties which they offer. 8 p. fully illustrated reference provides details on properties and uses.
416F Philadelphia Quartz Co.

Preservatives Fourteen different Dowicide preservatives currently increase manufacturing efficiency or improve product quality for paint, textile, petroleum, adhesives, etc. Industries. Full data on uses.
416G Dow Chem. Co.

Propellents Freon propellents are ideal for all types of products, & they are safe . . . nonflammable, non-explosive, virtually nontoxic. Digest of the 7th Annual Aerosol Market Survey made available.
416H E. I. du Pont de Nemours.

Pyridose Powder A coarse white or slightly yellow hygroscopic powder; slight odor of acetic acid. Effective, economical anti-silme agent for use in paper mills. Full data in Technical Information Sheet.
416I Mallinckrodt Chem. Wks.

Pyrrrole An extremely reactive chemical compound with a number of unusual characteristics, described in new technical reference—physical properties, potential applications, reactions, etc. Bulletin No. 27.
416J E. I. du Pont de Nemours.

Resins Epon resin coatings based on the XA-200 formulation . . . find outstanding success in the chemical process industries. Brochure covers full Epon coatings story—"Planning to Paint a Pyramid?"
111 Shell Chem. Corp.

Resins, Aminoplastics Wood waste can be converted to hardboard at low temperature cure & short cure cycle with new aminoplastic resins . . . which give high strength & do not discolor. Complete product data.
20-1e American Cyanamid Co.

Resins, Copolymer Architectural white enamel made with Cycopol 340-18 copolymer resin stay white longer & retain high gloss even under high humidity conditions. Furnishes complete product information.
20-1f American Cyanamid Co.

Sequestering Agents From aluminum to zinc, Perma Kleer-80 is 100% efficient in the chelation of most metal ions, including ferric, throughout the entire pH range. New, revised product Booklet now available.
416K Refined Products Corp.

Sequestering Agents.....Nullapons are outstanding sequestering or chelating agents capable of controlling, by deionization, undesirable di- or tri-valent metal ions in aqueous solution. Literature & samples.
417A Antara Chem.

Sesquicarbonate of Soda.....New booklet offered with detailed information on physical & chemical properties now being utilized to: improve products or processing; reduce manufacturing costs. Includes product samples.
147 Solvay Process Div.

Soda Ash.....Air-separation gives West End ash exceptional uniformity of particle size and density resulting in outstanding free-flowing characteristics. Provides samples, prices and technical information.
62 West End Chem. Co.

Soda, Caustic.....Company announces the availability of a 60 p. descriptive book on caustic. Valuable reference features one section devoted completely to the economics of transportation cost and prices.
417B Wyandotte Chem. Corp.

Soda, Caustic.....12 p. on economics of caustic soda. Answers many important questions such as "What form of caustic soda should I buy? How do I figure costs? How much will I save? What equipment will I need?"
417C Columbia-Southern Chem.

Soda Caustic....."Caustic Soda Buyer's Guide" contains helpful facts on economics of 50% & 73% solutions; other forms of caustic soda; capacities of tank cars & other containers; useful shipping data; etc.
156 Hooker Electrochem. Co.

Soda, Caustic.....The economics of 73% caustic soda solution are no longer reserved for the largest users... lower shipping costs now make it the best form for you. Offers comprehensive Caustic Soda Handbook.
417D Dow Chem. Co.

Soda, Caustic.....Plastic bound, 64 p. fully illustrated Manual on analysis, shipping, handling, storage and unloading—the authoritative handbook on caustic soda. Includes numerous charts, tables, diagrams, etc.
417E Columbia-Southern Chem.

Sodium, Metallic.....Atomic layers of metallic sodium can be coated on the surface of finely divided solids such as salt, soda ash, carbon, alumina, metal oxides and sand. Offers booklet, "High Surface Sodium."
417F U. S. Industrial Chem. Co.

Sodium Pentaborate.....Covers theoretical composition, physical and chemical properties, stability, hydrogen ion concentration, typical analysis, impurities, screen specifications, etc. Technical Bulletin No. 14.
417G Pacific Coast Borax Co.

Sodium m-Silicate.....Valuable data on Drymet anhydrous—the most highly concentrated form of sodium m-Silicate. Drymet File Folder contains complete technical information and suggested formulations.
417H Cowles Chem. Co.

Sodium Tetraborate Pentahydrate.....Now available in commercial quantities (Borax 5 Mol). Includes theoretical composition, typical analysis, bulking value, industrial uses, etc. in Technical Bulletin No. 2-M.
417I Pacific Coast Borax Co.

Solvents.....Assure controlled evaporation. In paint & surface coating industry... solvents offer precise characteristics to meet your most exacting requirements. Full data on characteristics & specifications.
253 Esso Standard Oil Co.

Solvents.....Describes Ketosol solvent 75... a mixture of acetophenone and phenyl methyl carbinol. Data on properties, container contents, methods of handling, potential applications. Technical Bulletin F-7370.
417J Carbide & Carbon Chem.



What's Behind the Name?

Styrene Monomer traces its chemical origin to coal, and Koppers is a leader in the coal carbonization industry. Consequently, Styrene Monomer is produced, literally, "from the ground up" by Koppers.

By carefully controlling the processing of Styrene Monomer, from the lump of coal to the delivered tank car, Koppers assures

you both the highest quality and the most dependable source of supply.

Styrene Monomer is only one of many synthetic chemicals produced by Koppers. Others include Resorcinol, Di-tert-butyl-para-cresol, Phthalic Anhydride, and Catechol.

For further information on any of these chemicals, write:

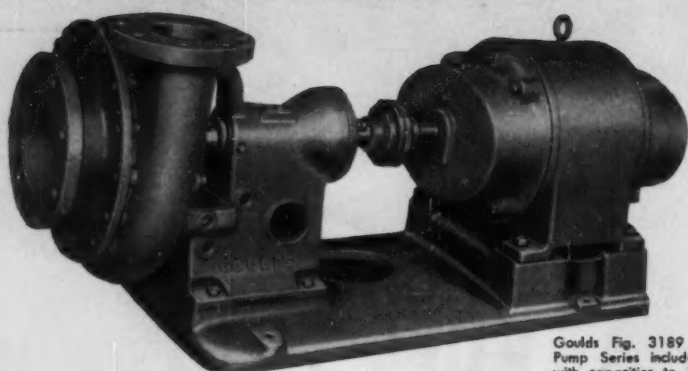
KOPPERS COMPANY, INC.

Chemical Division, Dept. CE-25, Pittsburgh 19, Pennsylvania



Koppers Chemicals

SALES OFFICES: NEW YORK • BOSTON • PHILADELPHIA • ATLANTA
CHICAGO • DETROIT • LOS ANGELES



Goulds Fig. 3189 Centrifugal Pump Series includes 10 sizes with capacities to 1080 GPM; heads to 180 ft.

interesting facts

... about a new series of Goulds Multi-Purpose Centrifugal Pumps

Newest in a line of heavy-duty centrifugal pumps reputed for their dependable, trouble-free operation, the Goulds Fig. 3189 Series offers you:

Versatility

You can use the Fig. 3189 single-stage, open impeller pumps for general water service, irrigation, circulation, slurries, transfer, factory wastes and for air conditioning. You can choose just the right pump for your need from 10 sizes with capacities ranging up to 1080 gallons per minute, with heads up to 180 feet at 1750 RPM.

Economy

The Fig. 3189 Series is made in the Goulds tradition—they're built to work hard and to last long. Their design accommodates wide interchangeability of parts, greatly reducing parts inventory requirements where many pumps are used.

Low Operating Cost

Modern hydraulic design provides high operating efficiency with relatively low power consumption. Impellers are statically and hydraulically balanced for smooth operation.

Operating Convenience

You can adapt the Fig. 3189 pump to various piping arrangements by swiveling the discharge nozzle to any one of three positions.

Maintenance Convenience

Wide openings in the support head give ready access to gland and stuffing box. Bearing housing is completely sealed to exclude moisture and dirt. *You can safely use the unit outdoors without fear of dirt harming the bearings and you can hose it down without fear of water damage.*

For specifications, performance curves and other interesting design details that contribute to long, economical service, send for illustrated Bulletin 720.4.



ATLANTA • BOSTON • CHICAGO • HOUSTON • NEW YORK
PHILADELPHIA • PITTSBURGH • TULSA

LITERATURE . . .

Solvents. Versatile solvents feature important applications in the manufacture of inks and dyes, resins and plasticizers, textile chemicals, etc. Request technical data on Poly-Solvs plus valuable product samples.
418A Olin Mathieson Chem. Corp.

Stabilizers, Vinyl. Pioneered commercial development of metallic-organic stabilizers for vinyl resins to inhibit degradation by heat and light. This and other developments in reference describing line.
418B Advance Solvents & Chem.

Sulphur Dioxide. A versatile chemical reagent for industry, sulphur dioxide can be used as a reducing or bleaching agent, preservative, antichlor, neutralizer, pH control. Details in "Virginia SO₂" Folder.
47 Virginia Smelting Co.

b,b'-Thiodipropionitrile Presents Technical Data Sheet which contains information on appearance and color, stability, solubility, uses and chemical properties, toxicity and safe handling instructions, etc.
418C Monsanto Chem. Co.

Tri-N-Amyl Borate. Presents descriptive information; molecular weight; density; boiling point; flash point; color; odor; solubility in organic solvents; stability in water; etc. Technical Data Sheet No. 3/OB.
418D Pacific Coast Borax Co.

Urea, Crystal. Purity and uniformity make it ideal for use in a large number of products and processes. Furnishes full details—specifications, chemical and physical properties, suggested uses, etc.
418E E. I. du Pont de Nemours.

Vaccines, Dust. Poultry can be mass-vaccinated against Newcastle Disease by spraying Biolator Newcastle Vaccine Dust Lederle into the house. Birds gain immunity by inhaling new vaccine. Complete details.
20-1g American Cyanamid Co.

Zirconium. 66 p. booklet, "Facts About Zirconium," offers information concerning the history and production of zirconium. Covers data on mechanical, physical and chemical properties, fabrication, etc.
418F Carborundum Metals Co.

Construction Materials

Castings, Centrifugal. Boeing chose Lebanon . . . to make the stainless steel casting for the powerplant of a jet truck. The complete story of this and other centrifugal castings available in a 12 p. Brochure.
51 Lebanon Steel Foundry.

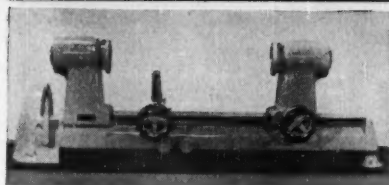
Castings, High Alloy. Announces the availability upon request of an interesting series of case histories showing how advance foundry techniques have brought new dimensions to the scope of high alloy castings.
307a Cooper Alloy Corp.

Cements. Baldwin-Hill Powerhouse cement . . . insulates and finishes. Company makes available a Bulletin which offers pertinent information on the composition, properties, efficiency, and low applied cost.
282 Baldwin-Hill Co.

Coatings, Protective. 12 p. illustrated Bulletin describes Lastiglass . . . a thermosetting resin base coating for all types of process equipment including tanks, piping, filter press equipment, etc.
418G Bishopric Products Co.

Coatings, Protective. Company makes available their Tygon Portfolio on request. Contains detailed technical information on the use of Tygon in its various forms, arranged in a convenient reference binder.
102 U. S. Stoneware Co.

GLASS WORKING LATHES



MODEL HSA

\$1335.00 f.o.b. Grass Valley, Calif.

GENERAL SPECIFICATIONS

Maximum length overall	63½"
Maximum width overall	18½"
Maximum length spindle nose to spindle nose	36½"
Height	20½"
Radial clearance above apron	9"
Spindle hole diameter	2⅝"
Approximate shipping weight	550 pounds
Net weight	Approx. 400 pounds

STANDARD EQUIPMENT

Variable speed pulley assembly
Two face plates
One collet draw-in bar
One twelve-fire single jet adjustable oxygen-gas or oxygen-hydrogen burner
Hand carburetion control
Foot pedal control of air or nitrogen supply and of oxygen-gas volume
Main air valve controlling air in either or both spindles
⅓ h.p. Motor, 110 volt, single phase, single speed, 60 cycle, AC
Face plate wrench
Two motor belts
One motor pulley

DO YOU KNOW?

That a first class glassblowing job requires accurate alignment of rotational axes between the headstock and footstock?

That variable spindle speed gives another dimension to your technique?

That simple chucking attachments supply versatility for wide varieties of applications?

That special chucking for your industrial procedures, or laboratory practices are available?

That Litton jet-mix fires are universally used in glassblowing to prevent reducing conditions?

That Litton Lathes have been the standard of the vacuum tube industry for 22 years, and have been constantly improved?

That you can get these precision tools at reasonable cost, in eight sizes, with swing from 8" to 42", and working length from 20" to 75½"?

Let us send you complete specifications and prices on our line of equipment and tools for the Vacuum Tube industry and for general research and development laboratory use.

3238


Litton Engineering Laboratories
Grass Valley, California • P. O. Box 949

You gotta be first...
to be best!*

*25 years ago, Alloy Fabricators started to build Stainless Steel, Monel, Inconel, Nickel and Aluminum Process Equipment. With this experience, naturally, they're your best bet today!

It's Still Our Only Business
— And We Mind It Well!

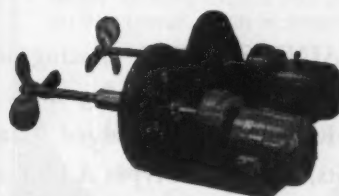


ALLOY FABRICATORS

DIVISION OF CONTINENTAL COPPER AND STEEL INDUSTRIES, INC.

PERTH AMBOY, NEW JERSEY

if **MIXING**
is the problem ...



ALSOP has the answer

For over 30 years, processing men have relied on the consistent high standard of Alsop Mixers—and the technical service of Alsop engineers to help solve their mixing problems.

If your process involves mixing, blending, suspending or dissolving it will pay you to invest in an Alsop Mixer. Available in portable or stationary models in a wide range of powers, speeds and propeller combinations for efficient, economical operation.

Write for complete information giving details of liquids and quantities to be handled.

ALSOP
ENGINEERING CORPORATION
1002 White Road Milldale, Conn.

It pays to buy - **ALSOP**
FILTERS - MIXERS - PUMPS & TANKS

NOW..

FOR INDUSTRIES
WHERE HEAT AND
CHEMICAL CONDITIONS
ARE EXTREME

Weldforged
TRADEMARK
STAINLESS STEEL
GRATING AND STAIR TREADS

**... ANOTHER BRAND NEW
KERRIGAN SERVICE TO INDUSTRY**

STAINLESS STEEL Grating and Stair Treads — new boon to industries where grating must withstand acids and corrosion! KERRIGAN *Weldforged* Grating — one-piece, inseparable units, made in all types A.I.S.I. and S.A.E. Standard Stainless and heat-resisting steels and electronically resistance welded to stand up under the severest kind of punishment AND FABRICATED TO BE FREE OF ANY "ACID-TRAP" RIVETS OR NOTCHES!

Kerrigan also offers you a complete *custom* service: shop drawings are sent for your approval and grating is fabricated to your exact specifications (with finished grating match-marked for easy installation). Let us send you detailed information. We shall welcome your inquiries on this new Stainless Steel Grating.

Write to

KERRIGAN IRON WORKS, Inc.

General Sales Office — 274 Madison Ave., New York City

LITERATURE . . .

Coatings, Protective.....With the development of "Alodine" No. 1000... a simple, economical, effective method is now available for providing invisible protection for aluminum & its alloys. Illustrated, 4 p.
420A American Chem. Paint Co.

Fabrication, Metal.....Booklet, "Facilities & Products," with information & photographs which show why company can turn out—at low cost—specialized heavy equipment for chemical plants, available upon request.
326 Newport News Shipbuilding.

Fabrication, Process Equipment.....16 p. fully illustrated Brochure describes in detail the facilities and capabilities of the company's plant and also outlines the various types of products which are manufactured.
420B Bishopric Products Co.

Insulation, Cellular Glass.....Covers information on the features and advantages of cellular, "stay-dry" insulation. Valuable booklets describe use of Foamglas to insulate piping, tanks and other equipment.
48 Pittsburgh Corning Corp.

Insulation, Pipe.....Lower heat losses, lower cost with new Snap-On glass fiber pipe insulation. Available in sizes that will fit pipe from 1/2" to 33" nominal diameter, inclusive. Samples and details on request.
37 Gustin-Bacon Mfg. Co.

Lead Products.....Valuable booklet covers corrosion-resistant lead products. Includes a series of graphs showing lead's corrosion-resistance to various corrosive solutions, plus other interesting information.
121 National Lead Co.

Plastics.....Kel-F plastic offers solution to plant equipment corrosion problems. Fluorocarbon plastic inert to virtually all chemical attack—mineral acids, oxidizing agents, caustics, etc. Complete details.
14-5 M. W. Kellogg Co.

Polyvinyl Materials.....Company makes available technical information about their line of Geon materials and how they can be made into products that resist abrasion, heat, cold, oil, gas, and numerous chemicals.
12a B. F. Goodrich Chem. Co.

Refractory Grain.....24 p. reference, "Norton Refractory Grain," offers many charts, tables and photographs in color—a wealth of information on nature, performance, and application of refractory grains.
247a Norton Co.

Steels.....Company presents descriptive reference, "Guide to Selection of Fastest Machining Steels," which includes revolutionary new leaded carbon and alloy steels. Illustrated Bulletin—Ryerson 99-1.
420C Joseph T. Ryerson & Son.

Steels, Alloy.....Announces a new steel which will enable you to improve the performance, lengthen the life, and reduce the cost of industrial equipment. Descriptive Booklet contains the full story of T-1 steel.
53 U. S. Steel Corp.

Steels, Stainless....."Machining of Armco Stainless Steels" gives specific recommendations on speeds, feeds & tool compositions as well as tool grinds & procedures for all Armco Stainless Types. 36 p.
420D Armco Steel Corp.

Steels, Stainless.....Covers superior stainless steel sheets, strip, bars, plates, wire, forgings, etc. Data in informative 44 p. booklet, "Making the Most of Stainless Steels in the Chemical Process Industries."
45 Crucible Steel Co.

Steels, Stainless....."A Stainless Profit Story for the Paper Industry" contains recommended applications for pulp and paper mills, and test data on stainless steels under specified chemical conditions.
420E Armco Steel Corp.

COLTON ROTARY PRESSES

CAPACITIES
65 TO OVER

5000

TABLETS
PER MINUTE

MIXERS—GRANULATORS—OVENS

FOR
HIGH PRODUCTION

AT
LOW COST

ARTHUR **COLTON** COMPANY

Established 1887

Div. Snyder Tool & Engineering Company
3518 E. LAFAYETTE • DETROIT 7, MICHIGAN



A Book You Should Have on Mechanical Sealing...

A complete reference catalog on Dura Seal—the engineered mechanical seal that rotates with the shaft. Amply illustrated . . . specific applications . . . installation data. A fact book of real value to designers, operators and maintenance departments.

**SEND FOR DURA SEAL CATALOG NO. 455-CE
DURAMETALLIC CORPORATION
KALAMAZOO, MICHIGAN**

... no other filtering medium compares with **ANTHRAFILT**

Trade Mark Reg. U. S. Pat. Off.



**Modern, All-Purpose
ANTHRAFILT
Stands Alone as the
One Filtering Medium
that is BEST for All
Types of Filters**

Years of efficient and economical use in every type of filter plant has made Anthrafil the standard of excellence in the filtering medium field.

ANTHRAFILT is made from selected Pennsylvania Anthracite, low in ash, high in anthraxlon, low in friability, correctly shaped and sized for best overall results in filtration.

**switch to
ANTHRAFILT
for more efficient
and economical
filtration**

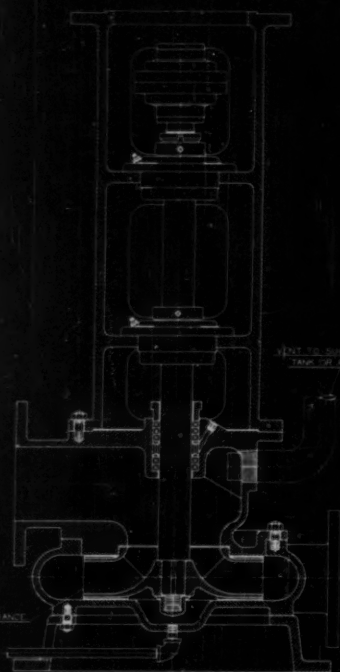
ANTHRAFILT provides greater capacity . . . longer filter runs . . . cleaner washings at lower cost . . . removes entrained turbidity from industrial process solutions or wastes.

*Write today for full details
and recommendations to:*

**PALMER
FILTER EQUIPMENT CO.**

P. O. Box 1696 — 822 E. 8th St.
Erie, Pa.

**Representing
ANTHRACITE EQUIPMENT CORP.**
Anthracite Institute Bldg., Wilkes-Barre, Pa.



Cross section of Lawrence Top Suction Non-Clogging Sludge Pump.

Lawrence Vertical Top Suction Non-Clogging Sludge Pump for handling volatile, gaseous sludge, sewage, etc.



PUMP volatile

SLUDGES AND SLURRIES

- ...without clogging
- ...under a low net positive suction head (NPSH)
- ...without gas or vapor binding

The Lawrence Non-Clogging Top Suction Pump is designed specifically to handle volatile sludges and slurries. Large clearances through the impeller and casing completely prevent clogging. Volatile gases or vapors liberated at the impeller entrance (the point of lowest pressure), are pushed up and out of the way and can be vented back to the suction tank or exhausted to atmosphere.

This type of pump can operate with a very low Net Positive Suction Head (NPSH) and never become gas or vapor bound. It is made in all metals and alloys such as: — cast iron, bronze, stainless steel, Hastelloy, etc. — depending on the material pumped.

For further details on Lawrence Non-Clogging Slurry and Sludge Pumps write for Bulletin 206-4.



LAWRENCE PUMPS INC.

371 Market Street, Lawrence, Mass.

LITERATURE . . .

Electrical & Mechanical

Ball Bearing Industrial Units Combination of important design features makes Sealmaster ball bearing units top choice for smooth running, dependable performance with minimum maintenance. Request Catalog 454. 422A Stephens-Adamson Mfg. Co.

Belts, V- Links are quickly joined by easy-to-use cup-washers & T-screws to make up individual belts. Easiest V-belt to couple & uncouple. Lasts longer—more flexible. Offers new 8 p. illustrated Catalog. 40 Mannheim Mfg. & Belting Co.

Clutches, Cam. A new comprehensive reference file includes catalogs describing the complete line of Morse cam clutches for indexing, over-running and backstop applications. Catalogs are fully illustrated. 422B Morse Chain Co.

Drives, Chain, Silent. 88 p. offers detailed engineering data. Covers design and application information, drive components and accessories, operational and technical data, etc. Illustrated Data Book No. 2425. 72 Link-Belt Co.

Drives, Variable Speed. Choose Varidrive for unequalled simplicity. Dependability proven by more than 20 years of highly successful performance. 2 to 10,000 rpm— $\frac{1}{4}$ to 60 hp. Illustrated, 16 p. Booklet. 79 U. S. Elecl. Motors.

Gaskets, Teflon. The ideal seal for many process applications is a Flexitallic gasket with teflon trapped between edges of stainless steel. For complete data request folder, "Teflon in Flexitallic Gaskets." 276 Flexitallic Gasket Co.

Gaskets, Teflon-Jacketed Includes pertinent information on corrosion-resistant teflon-jacketed gaskets for glass-lined steel connections, Corning conical flanges, etc. in illustrated Catalog No. TG-953. 256a U. S. Gasket Co.

Motor Starter-Circuit Breakers. Explosion-proof, dust and rain-tight circuit breaker and motor starter Unilets offer superior design, construction and performance. Company releases complete information. 94 Appleton Elec. Co.

Motors. Cast iron frame motors for extra protection in corrosive atmospheres. Features include completely protected laminations, special varnish treated windings, a running shaft seal. Bulletin MU-132. 268 Wagner Elec. Corp.

Motors. For dirty or corrosive location or for outdoor operation in all kinds of weather. Full information on tube-type totally-enclosed, fan-cooled and explosion-proof motors in Bulletin No. 51B7149. 261 Allis-Chalmers Mfg. Co.

Motors, Chemical Performance Rated features resist chemical corrosion: cast-iron fan guard; cast-iron terminal box; cast-iron frame and end brackets; etc. Company makes available full product information. 77 Century Elec. Co.

Packings & Gaskets. Valuable reference furnishes complete information on Chempac-Interlocked and other J-M Chempac packings and gaskets for the chemical and process industries. Illustrated Folder PK-80A. 76 Johns-Manville.

Reducers, Speed. All advantages of shaft-mounting . . . all proven performance & economy features of Dodge Torque-Arm speed reducers . . . are now available for your big jobs. Bulletin offers full details. 28-9 Dodge Mfg. Corp.

Seals, Mechanical......Combining chemically impervious teflon with a balanced bellows design—Chemiseal external mechanical seals last longer & give unsurpassed performance. Details in Bulletin No. MS-954.
294 U. S. Gasket Co.

Starters, Motor......Built in wide range of ratings for squirrel-cage, wound-rotor & synchronous motors... for full or reduced voltage... reversing or non-reversing. Details in Bulletin No. 14B6410B.
271 Allis-Chalmers Mfg. Co.

Transmission Parts, Conveyor......Modern conveyors demand perfect performance from even the smallest part. That is why Jeffrey's smaller replacement parts feature superior precision & design. Technical literature.
90a Jeffrey Mfg. Co.

Transmissions, Variable Speed......Illustrated Booklet contains valuable information; numerous features; operation; construction; dimensions; selection tables; installation data; ordering and prices; etc. 4 p.
423A Standard Transmission.

Turbines, Steam......Turbines range from 150 horsepower down to fractional in 6 frame sizes. Feature large number of manually operated valves for individual control of steam nozzles. Details in Bulletin 135.
52 Coppus Engrg. Corp.

Wattage Control......Describes how a revolutionary, simple, unique method gives fully automatic proportional wattage control for straight line temperature control throughout entire oven range. Illustrated 8 p.
429B Blue M Elec. Co.

Handling & Packaging

Conveyors......"Natural-Frequency" conveyors feature numerous advantages: high conveying speed; greater capacity; less power required; less maintenance and down time; no dampening under load; etc. Bulletin 111.
259 Carrier Conveyor Corp.

Conveyors......Push buttons route carbon black thru dust-tight zipper distributing system. If you have a dust or degradation problem... find out how much a Zipper System offers you. Request Bulletin No. 349.
329 Stephens-Adamson Mfg. Co.

Conveyors, Screw......Feature efficient operation plus long-life, low maintenance service. Company makes available a 92 p. screw conveyor book of pre-engineered selection and application data. Book No. 2289.
58 Link-Belt Co.

Conveyors, Vibrating......"Natural Frequency" vibrating trough conveyors convey bulk or packaged material horizontally or up inclines to 10° at speeds up to 70 fpm. Offers full description in Bulletin No. 353.
423C Stephens-Adamson Mfg. Co.

Drums......Tight head or removable head types... protect sensitive chemicals, oils, and food products against contamination during shipment or in storage. Data in Hackney Drum and Barrel Catalog.
267 Pressed Steel Tank Co.

Drums, Magnetic......Eriez magnetic drum is an unbeatable unit for extracting tramp iron from materials conveyed in spouts, chutes, spiral conveyors, etc. Find complete information on drum in Bulletin B-601.
84a Eriez Mfg. Co.

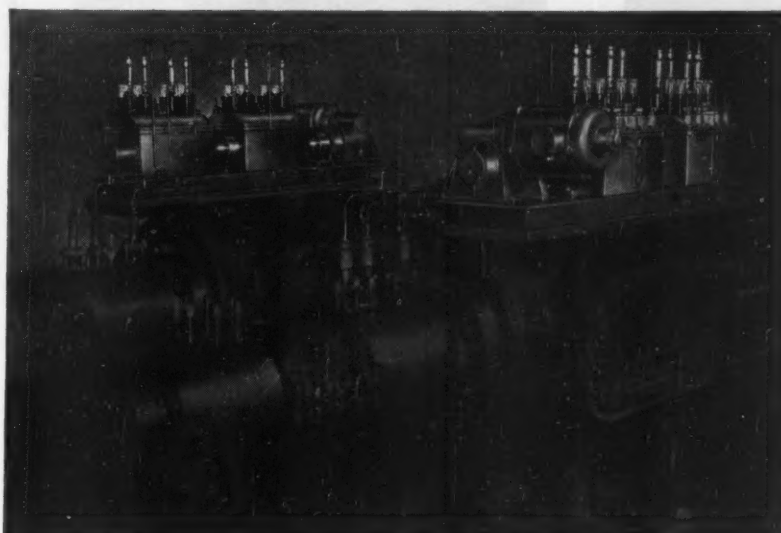
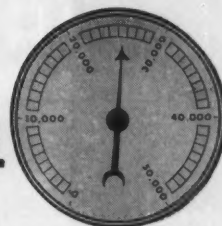
Feeders......Model E in stainless steel... controlled feeding of liquids, with precision, dependability and low cost. Includes data on numerous features, specifications, etc. in fully illustrated Bulletin 540.
423D Clarkson Co.

High Pressures

HOLD NO TERROR

FOR Manzel

FORCE FEED LUBRICATORS!



Where dependable lubrication under high pressure is essential to the efficiency of such equipment as pumps and compressors, Manzel has the answer. Models are available for operation against discharge pressures of up to 30,000 P.S.I.G. Manzel thus offers the Chemical Industry the means of insuring maximum life of oil seals — and competent assistance in engineering special lubricator installations to meet specific needs. For Force Feed Lubricators — and Chemical Feeders, too, — put Manzel at the top of your list of those to call.



DIVISION OF FRONTIER INDUSTRIES, Inc.
324 BABCOCK STREET, BUFFALO 10, NEW YORK

designers

and

builders

of

equipment

for

basic
industries

• Conveyor
Systems for
Petroleum
Coke

• Autoclaves

• Special
Valves

• Special
Fittings



McNally WELDMENTS

AT plants in Ohio and Kansas, McNally Pittsburg is fully equipped to produce heavy weldments. Your equipment can be designed from your sketches; or built to your detail drawings. For one piece or a trainload, these plants are ready to serve you today.



McNally VALVES

FOR heavy duty or special duty, McNally Valves give accurate control and long life. The standard line includes: Abrasion resistant, Gate, Motorized Gate, Cock, Quick Opening, Check, Butterfly, Special valves made of Cast Iron, NiHard or Brass. Fabricated steel valves made to your specifications.

— Manufacturing Service —
Specification Cast Iron Assembly
Heavy Machining Platework
Stress Relieving Structural Steel
Consulting Services without Obligation
WRITE for DESCRIPTIVE BULLETINS

M^c

NALLY PITTSBURG
MANUFACTURING CORPORATION

"Fifty Years of Knowing How"

Wellston, Ohio

Pittsburg, Kansas

LITERATURE . . .

Feeders, Disc. Outstanding in its simplicity, sturdiness and ease in adjustment. Particularly suitable for handling bulky, sticky, hot materials. Requires a minimum of head room. Find details in Bulletin 33-E.
424A Hardinge Co.

Feeders, Volumetric Volumetric feeders of simple design and rugged construction, easily adapted to installations requiring proportional pacing by auxiliary meters. Describes feeders in Bulletin 45-H8.
88 Omega Mach. Co.

Scales, Checkweight Suspended conveyor scale check-weighs open or closed packages weighing up to 200 lbs. at rates up to 16 a minute. Covers description, performance & specifications of Model 100S.
424B Thayer Scale & Engrg. Corp.

Tractor-Shovels More yardage moved . . . in fastest time . . . with a Michigan tractor-shovel. Company announces the availability of specifications plus a Lease Plan Data Sheet.

Tractor-Shovels Provide important benefits: greater carrying—lifting—digging—bucket capacities; an increased dumping height; a shorter turning radius; improved safety features; etc. Full information.
216-7 Frank G. Hough Co.

Trucks, Drum Rotator drum truck—a powerful, compact, portable, motorized unit—safety rotates standard drums at 10, 20 or 40 rpm with loads up to 500 pounds. Complete details contained in Bulletin R-1248.
424C Morse Mfg. Co.

Trucks, Industrial Describes Yale gasoline, diesel and LPG industrial lift trucks in capacities ranging from 1000 to 10,000 lbs. Includes cutaway photographs which show valuable features. Bulletin 5101C.
424D Yale & Towne Mfg. Co.

Heating & Cooling

Boilers Numerous valuable features make self-contained boilers first choice for commercial, institutional and industrial applications. In sizes 15 to 500 hp, 15 to 250 psi. Details in Catalog No. AD-100.
43 Cleaver-Brooks Co.

Condensers & Reboilers Standard stainless steel vapor condensers & Thermosyphen reboilers designed to meet the exacting requirements of the chemical & process industries. Full details in illustrated, 8 p.
424E Doyle & Roth Mfg. Co.

Coolers For efficient, economical product cooling . . . designed to meet highest standards of construction . . . engineered to provide greatest improvements in thermal design. Features & specifications.
424F Doyle & Roth Mfg. Co.

Coolers, Cascade Designed for cooling corrosive liquids and gases. Low initial cost and maintenance, radiused returns for low pressure drop as well as redwood waterguide strips. Catalog No. S-6820.
210e National Carbon Co.

Coolers, Rotary Ruggles-Coles rotary coolers employed for cooling hot materials after high-temperature drying or calcination. Three types: air cooled, partially submerged & spray types. Data in Bulletin 16-D.
424G Hardinge Co.

Furnaces, Vacuum Supplies pertinent information on the company's new 30-pound induction-heated vacuum furnace. Includes data on the complete line of induction, resistance & arc furnaces in Naresco Catalog.
424H Naresco Equipment Corp.

Heat Exchangers.....Describes how equipment offers chemical resistance to practically all corrosive fluids; resistance to severe thermal shock; high heat-transfer rates; low maintenance; etc. Catalog S-6740.
219c National Carbon Co.

Heat Exchangers, Tube Bundle.....New standardized heat exchanger design features lower first cost, more area per unit, choice of tube lengths, faster delivery, etc. Company offers full details in Catalog S-6840.
219d National Carbon Co.

Heat Transfer & Crystallization.....Offers descriptive literature—a 52 p. book giving practical presentation of the fundamentals of modern evaporation & crystallization methods & equipment. Bulletin No. E-106.
71 Swenson Evaporator Co.

Humidity Conditioning.....Stops moisture regain in ammonium nitrate using 87°F coolant to get 46°F dew-point. Economical, rugged & safe Kathabar units are fully described in Literature Group No. K54-3.
70 Surface Combustion Corp.

Platecoils.....Designed for tank heating and cooling problems due to inefficient pipe coils. These cost-saving Platecoils heat or cool 50% faster and take 50% less space in the tank. Offers Bulletin P61.
86 Tranter Mfg.

Preheaters, Air.....Ljungstrom air preheater makes fuel burn more completely—at a higher temperature—greatly reducing the rate of slag build-up on furnace tubes. Company furnishes full product information.
157 Air Preheater Corp.

Towers, Cooling.....New 20 p. booklet, "Test Your Tower," describes simple direct method by which purchaser of industrial cooling tower can assure himself that he will receive performance exactly as specified.
9 Marley Co.

Traps, Steam.....Larger valve orifice saves four ways: initial cost; upkeep expense; warm-up time; production time. Six types for every process, heat, power use. Complete information in Trap Catalog 953.
127 W. H. Nicholson & Co.

Instruments & Controls

Analyzer-Recorders, Oxygen-Combustibles.....Provide a continuous two-in-one check of combustion efficiency by recording both oxygen & combustibles in flue gas. Product Specifications Nos. E65-1 & E12-5.
50 Bailey Meter Co.

Analyzers.....Infra-red gas and liquid analyzers for automatic analysis of fluid mixtures, measurement of toxic contaminants in air, precise process control. Bulletin furnishes complete information.
93b Mine Safety Appliances Co.

Analyzers.....Tri-Non & Bichromator analyzers continuously record concentration of any desired stream component. Each is sensitized & adjusted to specific plant conditions before shipping. Full details.
227 Perkin-Elmer Corp.

Controllers, Indicating.....Series 540 "On-Off" indicating controller... is a rugged, durable & accurate remote indicating temperature control instrument designed for general industrial use. Illustrated.
425A Fenwal, Inc.

Controllers, Indicating.....For control of simple processes—temperature, pressure, liquid level, humidity—investigate convenience and precise, reliable performance of M/41A controllers. Bulletin No. 5A-13.
54 Foxboro Co.

Progress Report

to users and
prospective users of
NATIONAL

(CAST IRON)

COOLING AND CONDENSING SECTIONS

The following new developments in National Cooling and Condensing Sections are announced in the interest of effecting further operating economies and performance value:

1. **SHOP ASSEMBLY.** National Sections, while easily and economically assembled in the field, can now be shipped assembled in stacks, tested and ready for use, at surprisingly little extra cost. This now applies to domestic shipments as well as for overseas.

2. **PROTECTIVE COATINGS.** For services where cooling water is excessively corrosive or fouling, National Sections coated with recently developed Kolmetal have proved to be unsurpassed in increasing life and long range efficiency plus reducing maintenance costs for cleaning to virtually zero.

3. **EVAPORATIVE OPERATION.** It is now a proved fact that National Sections can be operated as a combination exchanger and cooling tower, with excellent approaches between ambient wet bulb and final product temperatures.

4. **FURTHER RESEARCH.** Now under consideration and development are several new materials from which National Sections may be cast, in addition to currently available close grained gray cast iron and chrome nickel iron. These developments will be of particular interest in connection with the handling of flammable fluids. Further announcements in this field will be forthcoming soon.

These new developments plus the fact that National Cooling and Condensing Sections are performing in many industrial, chemical and oil field and refining applications with high efficiency and with minimum maintenance prove that it pays to consult with National about your cooling and condensing problems. Write for our latest Bulletin CEC-54.



R. M. Specht
R. M. SPECHT
Manager

THE **NATIONAL** HEAT TRANSFER DIVISION
RADIATOR COMPANY
JOHNSTOWN, PENNSYLVANIA
HEAT TRANSFER DIVISION HEADQUARTERS
60 EAST 42nd STREET, NEW YORK, NEW YORK

PRESENTING!



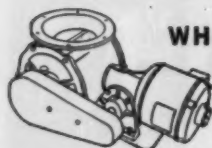
THE MOST ADVANCED ROTARY AIRLOCK FEEDER

For stopping air leakage—when removing powdered or granulated materials from dust collectors, air classifiers, spray or rotary dryers and pneumatic conveying systems . . . it can be done more efficiently and economically with a PRATER ROTARY AIRLOCK—the answer to industry's need for a heavy duty unit.

Available in 8, 10 and 12 inch sizes, it's ideal for handling practically any highly abrasive or soft granulated or attritionized material. Inquire today!

Sooner or later...
You'll make it

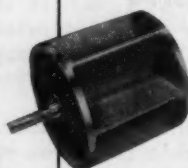
PRATER



WHAT'S YOUR PROBLEM? Jot down the details of your application and mail them to us. Our engineers will help you plan your flow sheet and specify the proper equipment.

PRATER PULVERIZER COMPANY
1517 S. 55th Court • Chicago 50, Illinois

Foremost Builders of Airlocks



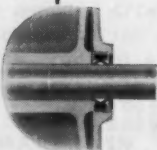
CLOSED POCKET ROTOR

An unusual design—with integral side plates and blades, no side wear, better sealing and longer life.



OVERSIZED BEARINGS!

Standard in all PRATER FEEDERS. Self-contained, self aligning, lubricated and sealed for life.



LEAK-PROOF DUST SEALS!

Unusual shaft seals prevents flushing of material and retains pressures—positive or negative.

LITERATURE . . .

Controls. . . . Sales and service centers offer fast, efficient and convenient service on finest in automatic controls for regulation of pressures, temperatures, liquid levels, flow. Climax Controls Catalog.
101a Black, Sivalis & Bryson.

Controls, Temperature. . . . Illustrated Bulletin describes line of temperature controls. Covers Models VD-2S, VD-2C & VD-2X, & explains purpose, operation, tube construction, switch action, etc. Bulletin No. 105.
426A Burling Instrument Co.

Controls, Valve. . . . Wherever convenient automatic valve operation is desired or where an emergency may demand rapid, safe and positive remote operation—Lim/Torque is the answer. Details in new Catalog No. L-54.
98 Philadelphia Gear Wks.

Indicators, Oxygen. . . . Data on compact, accurate instruments designed to continuously measure the oxygen content of industrial atmospheres. Bulletin describes in detail the valuable features and applications.
93a Mine Safety Appliances Co.

Instrumentation, Waste Treatment. . . . New methods of waste treatment aided by Electronic instrumentation. Details in Bulletin No. 7302, "Instrumentation for Water, Sewage & Industrial Waste Treatment."
164-5 Minneapolis-Honeywell

Measuring Systems, Pressure & Temperature. . . . Describes new ElectroSyn simplified system with electrical transmission for remote indication and control of pressure and temperature. Illustrated Bulletin 6351.
426B Control Engrg. Corp.

Meters. . . . Type 316 stainless steel meter for corrosive liquids . . . is answer to many measurement problems in food, chemical, drug & industrial processing fields—it resists corrosion. Bulletin No. OG-406.
53a Rockwell Mfg. Co.

Servo Analyzers. . . . Automatic measurement and plotting of phase and attenuation characteristics. Includes description of components and operating instructions in company's fully illustrated Bulletin 1170.
426C Minneapolis-Honeywell.

Thermometers. . . . Sturdy all-metal construction resists breakage, makes for far longer life on operating equipment. Exclusive multiple helix assures dependable accuracy during long life. Descriptive Bulletin.
44 Weston Elec. Instrument.

Pipe, Fittings, Valves

Couplings, Flexible. . . . New Selection Guide offers technical data—ratings, drawings, specifications, service factors, plus information on various uses of rubber-bronze bushed flexible couplings. Bulletin No. 57.
426D Ajax Flexible Coupling Co.

Fittings. . . . Offers Klinger Master Catalog describing the complete range of products . . . compressed asbestos sheet packings for all purposes, valves, cocks, level gages, synthetic and silicone rubbers, etc.
243a Klinger Corp. of America

Fittings, Stainless Steel. . . . Complete details and specifications covering the full line of Tri-Clamp stainless steel fittings are available in company's new informative reference. Request Catalog No. 1-154.
82a Tri-Clover Div.

Fittings, Stainless Steel. . . . Three good reasons for purchasing Cooper Alloy stainless steel fittings—availability (quick—when you need it) . . . superior quality . . . complete line. Fitting Catalog 52F.
307b Cooper Alloy Corp.

Hose, Metal, Flexible..... Ideal for difficult fluid and gas handling jobs. Durable and leak-proof for conveying, controlling movement and vibration, correcting misalignments, etc. Full details in Bulletin No. 20D. 269 Atlantic Metal Hose Co.

Nozzles, Spray..... Reach a new peak in spraying efficiency... with Yarway non-clog nozzles. Reference includes capacities, dimensions, application information, etc. Request Spray Nozzle Book No. N-617. 152 Yarnall-Waring Co.

Pipe & Fittings..... For corrosion-resistant piping. Impervious graphite pipe & fittings readily installed, long lasting, easily maintained, unaffected by most corrosive fluids. Request Catalog No. S-7000. 219b National Carbon Co.

Piping for Industry..... Complete prefabricated piping systems for all pressures and temperatures... plus a full line of functional spring hangers, constant support spring hangers, etc. Bulletin No. 2443. 81 Blaw-Knox Co.

Tubing & Pipe, Stainless Steel..... Has been supplying electric resistance welded stainless steel tubing and pipe to process industries for the past twenty-five years. Complete information available on request. 24-5a Republic Steel Corp.

Valves..... Company furnishes "Valve Selection Charts" particularly developed for quickly selecting valve types according to size, temperature, pressure, actuating means and liquid or gas service. 427A Futurecraft Corp.

Valves..... Company makes available popular entertaining pamphlet, "The Fox & the Hare," presenting a story about the recognition of Balanseal valves. It is humorous & enlightening. Request your free copy. 30-1b Farris Engrg. Corp.

Valves..... New Crane corrosion-resistant valves in 18-8 SMO and Craneloy 20... gate, globe and angle patterns. Both lines come with screwed or flanged ends. Full information given in Circular AD 2059. 277a Crane Co.

Valves..... Describes Alloyco 20 corrosion-resistant valves. Incorporates recent field-test data on Alloyco 20 in various concentrations of sulfuric acid at different temperatures. Illustrated Bulletin No. 8. 427B Alloy Steel Products Co.

Valves, Diaphragm Control..... Complete information on company line of diaphragm control valves in K&M Valve Engineering Data Catalog. Bulletin CV53. Also provides the new Valve Size Slide Rule Calculator. 46 Kleley & Mueller.

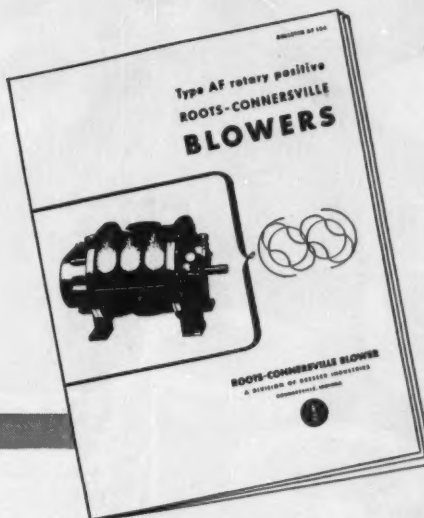
Valves, Globe & Check..... Available in a variety of alloys to meet needs & in sizes from 1" & up, valves incorporate features which extend service life & make maintenance easy. Offers Bulletins H-1 & H-2. 61a LaBour Co.

Valves, Porcelain..... Company makes available detailed literature covering the features and advantages of porcelain valves. Bulletin includes complete description, characteristics and specifications. 96 Lapp Insulator Co.

Looking for something?

You can bank on spotting it—and fast—in our new, master Index to Chemicals & Equipment in this issue. You'll find it a complete, finger-tip reference to this month's advertised items and new product developments.

Send for new information on R-C Rotary Positive Blowers



CHECK THE "BIG 4" ESSENTIALS

1. Accurate volume at required pressure
2. High efficiency—low operating cost
3. Low maintenance cost—low down time
4. Freedom from oil or oil vapor contamination

Check your present blowers and if they don't measure up, it may be an economy to replace them with modern R-C equipment.

For your present needs, or for future reference, you'll find highly useful information on the smaller sizes of Roots-Connorsville Rotary Positive Blowers in this new Bulletin No. AF-154.

Especially important are the tables showing sizes, pressures, capacities and other characteristics to help you select blowers for specific applications.

You'll also find included factual data which points out why R-C Blowers meet the "BIG 4" essentials of successful performance.

If your files are not complete on other Roots-Connorsville equipment for handling air and gas, ask for bulletins on:

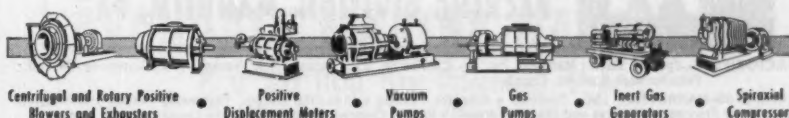
Centrifugal Blowers and Exhausters ... 120-B-14
Positive Displacement Meters ... M-152
Gas Pumps (small) ... 31-B-17
Gas Pumps (large) ... 32-33-B-13
Spiraxial Compressors ... SC-354
Vacuum Pumps ... 50-B-13
Inert Gas Generators ... 100-B-14
Rotary Positive Blowers (large sizes) ... RB-254

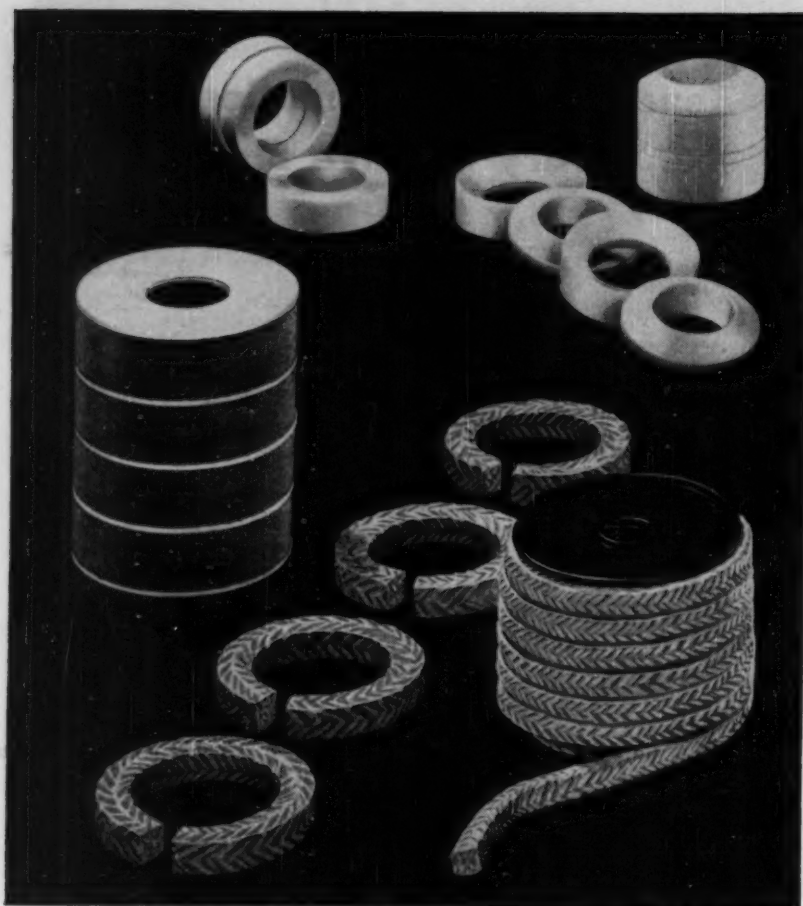
For any problem of handling gas or air, consult Roots-Connorsville, now in their second century of building such equipment, exclusively.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.
255 Illinois Ave. • Connorsville, Indiana

Roots-Connorsville Blower (Canada) Ltd. • 629 Adelaide St. W., Toronto, Ont.





YOU CAN SOLVE YOUR TOUGHEST SEALING PROBLEMS WITH **R/M** *Teflon**

Take, for example, R/M No. 840-W. Here you have a valve stem packing specially designed for use against solvents and oils—and for applications where food contamination is a problem. A counterpart, R/M No. 840-B, made with blue instead of white asbestos, is ideal for use against corrosives and acids. Both of these packings are efficient at temperatures up to 500°F. For pumps, you can't beat

R/M No. 843, a skillful blending of "TEFLON" and South African blue asbestos. It's right for pumps handling corrosives and all acids except nitric—up to 220°F.

The complete R/M "TEFLON" products line includes rods, sheets, tubes, tape, packings, gaskets, rings, and irregular shapes. For complete information, see your R/M distributor.

*Du Pont's trade-mark for its tetrafluoroethylene resin

**R/M MAKES A COMPLETE LINE OF PACKINGS AND GASKETS—
AVAILABLE FROM YOUR R/M DISTRIBUTOR**

PACKINGS

RAYBESTOS-MANHATTAN, INC.

PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Bowling Balls

LITERATURE . . .

Valves, Safety Relief The ultimate in nozzle valve construction with complete standardization and interchangeability in every part. Offers Catalog 48Ra covering product line and Technical Manual 51B.
30-1a Farris Engrg. Corp.

Process Equipment

Absorbers For absorption of hydrogen chloride and other gases. Produce as much as 20 tons per day 25° Baume acid. Pneumatic automatic control. Complete information offered in Catalog No. S-7460.
219f National Carbon Co.

Autoclave-Reactors Company provides engineering knowledge, fabricating skill, facilities . . . for greater reliability. In any capacity, for any pressure, temperature or reaction. Full details in Catalog 2413.
151 Blaw-Knox Co.

Blenders, Twin Shell In plant after plant . . . the Patterson-Kelley twin shell blender does the job better, faster, and lasts longer. For complete information on product line request descriptive Catalog 13.
105 Patterson-Kelley Co.

Centrifugals, Continuous Illustrated Bulletin describes application of continuous centrifugal filters, listing 75 materials on which they are successfully used, with specific examples of performance.
428A Bird Mach. Co.

Centrifugals, Suspended Presents detailed information upon request covering company line of Suspended Centrifugals with Gyro-Balanced suspension head, & optional unloading & time control equipment.
428B Bird Mach. Co.

Classifiers, Continuous Centrifugal Company makes available descriptive literature on continuous centrifugal classifiers—what they do, how they work, with examples and pictures of successful applications.
428C Bird Mach. Co.

Concentrators For the toughest concentrating and separating jobs. High capacity, heavy duty Nozjector is capable of handling loads up to 40 hp input without power loss or motor strain. Bulletin No. 1276.
137 Sharples Corp.

Crushers, Jaw Illustrated, 24 p. booklet offers complete information on company's line of jaw crushers. Built in eight sizes with capacities up to 300 tons per hour. Details available in Bulletin No. 1124.
249b Traylor Engrg. & Mfg. Co.

Crystallizers, Vacuum 8 p. booklet describes Swenson crystallizers—individually engineered for minimum cost, maximum recovery of crystals, top quality of product. Request illustrated Bulletin No. C-100.
7g Swenson Evaporator Co.

Dryers Lectro-dryers can dry air & gases in volume to dewpoints below -100°F—can drop relative humidity lower than 10%. Booklet describes machines & how various industries use them to gain efficiency.
73 Pittsburgh Lectrodryer Corp.

Dryers, Spray Folder on research spray dryer—describes and illustrates Swenson's completely packaged spray dryer for laboratory and pilot plant operations. Request informative Bulletin No. D-106.
7d Swenson Evaporator Co.

Drying Equipment, Spray 16 p. includes facts, photographs, and diagrams explaining the principles and advantages of spray drying and the Swenson plant-scale research laboratory. Request Bulletin D-105.
7c Swenson Evaporator Co.

Dust Collectors.....In almost every type of industry . . . users have found high efficiency, simplicity & economy of Dustube collectors a difficult combination to equal for top performance. Catalog No. 372.
318 American Wheelabrator.

Dust Filters.....Help solve dust control problems. Describes the numerous advantages of using the Day line of high pressure reverse jet filters . . . for efficient dust control. Illustrated Bulletin No. 528-R.
239 Day Co.

Dust Recovery.....New profits in terms of valuable dust that can be returned to production rather than wasted in the air. Presents an informative Brochure which describes three systems of industrial dust recovery.
257 Buell Engrg. Co.

Evaporators.....Booklet on long-tube vertical evaporators—describes high capacity, steam-saving evaporators for concentrating mobile & foamy liquids & heat-sensitive materials. Illustrated Bulletin No. E-100.
7a Swenson Evaporator Co.

Evaporators.....Booklet on forced circulation evaporators—tells about Swenson "F.C." evaporators for continuous economical concentration of viscous, salting & scaling liquors. Illustrated Bulletin No. E-107.
7b Swenson Evaporator Co.

Filters, Pressure Leaf.....Supplies valuable literature outlining the design and construction advantages of new pressure filter. Also provides a table of filter sizes and capacities covering sixty-six models.
429A Bird Mach. Co.

Filters, Pressure Leaf.....For flow rates two to five times greater than cloth covered presses; positive removal of all suspended solids to desired degree of clarity; etc. Find complete details in new Catalog NC-1-53.
203 Niagara Filters Div.

Filters, Rotary Vacuum.....Covers design features . . . for handling both slow filtering & free filtering solids; how it discharges thin cake by pneumatic blow-back, & utilizes thorough counter-current wash.
429B Bird Mach. Co.

Filters, Top-Feed.....Furnishes an illustrated folder presenting Swenson's efficient, money-saving top-feed filter equipment that dewater and dries crystalline materials in one process. Bulletin No. F-101.
7f Swenson Evaporator Co.

Filters, Vacuum.....Booklet on rotary-drum vacuum filters—describes & illustrates Swenson job-engineered filter equipment for continuous low-cost, efficient filtration & washing. Request Bulletin No. F-100.
7e Swenson Evaporator Co.

Generators, Inert Gas.....Aid in solution of purging or blanketing problems. Complete with the latest fire checks and safety devices. For essential details and technical information request Bulletin 1-10.
306 C. M. Kemp Mfg. Co.

Kilns, Rotary.....Efficient thermo-processing of products. Used in the production of lime, bauxite, cement, sodium silicate, alumina, etc. Complete data on design features offered in illustrated Bulletin No. 1115.
249a Traylor Engrg. & Mfg. Co.

Kilns, Rotary.....Every part is precision designed, precision built to give you maximum protection against mechanical troubles of all kinds. Offers complete information in illustrated Bulletin No. A-422.
92a Vulcan Iron Wks.

Mills, Ball & Pebble.....Outstanding in the field of fine grinding, mixing and processing. Built of all steel welded construction. They feature great strength and ruggedness. 20 p. illustrated Catalogue No. 100.
237h International Engrg.

serving the Foundry needs
of the
Chemical Industry

SERVICE FOUNDRY



quality control throughout

... for all the needs of the chemical industry,
as replacements or for new construction.

Special parts, such as pump impellers— of stainless
steel, monel and other special metal requirements.

Service Foundry engineers have had many years of
on-the-job experience and the name "Service"
is famous throughout the Industry for expert metallurgical
control, uniformity of casting, and top workmanship
throughout. For your needs call . . .

SERVICE FOUNDRY

416 Erato Street, New Orleans, U. S. A.

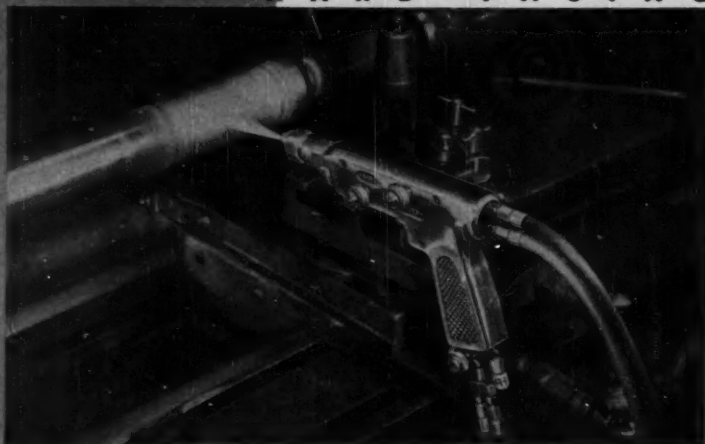
a division of

AVONDALE MARINE WAYS, INC.

P. O. Box 1030, New Orleans, U. S. A.

Cable Address: "Serfdry"

Fight corrosion with COLMONOY HARD-FACING



... one test showed the way!

Table shows metal loss in inches per year of 18-8 stainless and Colmonoy No. 6, caused by the corrosive media indicated.

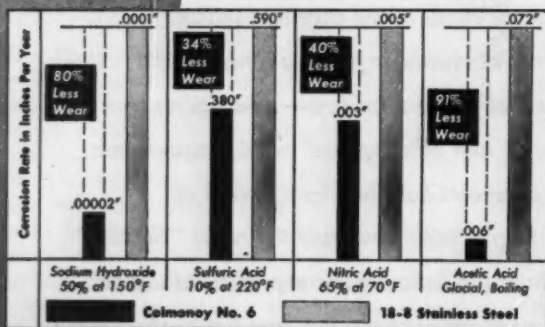


Table above shows how COLMONOY No. 6 gives superior resistance to many corrosive agents, as well as to abrasion and galling.

There are several ways to apply COLMONOY alloys. Spraywelding is economical and the fastest way to produce a superior hard-facing on cylindrical, machined parts.

HARD-FACING ALLOYS

WALL COLMONOY

C O R P O R A T I O N

BIRMINGHAM • BUFFALO • CHICAGO • HOUSTON • LOS ANGELES
LINDEN • MORRISVILLE • PITTSBURGH • MONTREAL • GREAT BRITAIN

Write today for the
Colmonoy Hard-
facing Manual 77
and the Spraywelder
Catalog.



LITERATURE . . .

Mills, Grinding Mills applicable for wet or dry, coarse or fine grinding. Assure a uniform product of desired fineness. Improved design and construction features fully described. Illustrated Bulletin No. 8121.
249c Traylor Engrg. & Mfg. Co.

Mills, Hammer Williams heavy-duty hammer mills feature numerous valuable advantages: increase your output; improve product quality; reduce your cost-per-ton; etc. Find details in complete product Catalog.
80a Williams Patent Crusher.

Mills, Roller Ball bearing roller mills feature: trouble-free service; smoother, quieter, higher speed operation; greater capacity; exceptional uniformity of finished product; etc. Completely illustrated.
6c Schutz-O'Neill Co.

Mixers Announces 24 p. fully illustrated "International Mixer Pictorial" which covers company's line of portable mixers, propeller mixers, mixer drive heads, side entrance mixers, etc. Catalogue No. 79.
430A International Engrg.

Mixers Agitation specialists show how their services can help you attain the desired goal in process agitation—highest efficiency at lowest outlay cost. Covers mixer line in illustrated Catalog No. B-105.
201a Mixing Equipment Co.

Mixers The Eppenbach Homo-Mixer is a high speed, high shear homogenizer-mixer. Literature covers description, method of operation, numerous advantages, etc. Request fully illustrated, 8 p. Catalog 402-R-1.
430B Admiral Tool & Mfg. Co.

Mixers Mixers meet tremendous variety of fluid mixing needs. Includes valuable data on side entering mixers, top entering mixers, portable mixers, etc. Request four helpful catalogs—Catalog Series 17.
85a Eastern Industries.

Mixers Data on turbine & slow speed heavy duty agitators . . . for open & closed tanks. Covers operation & applications of super-turbine & injection mixers, mixer data, mixer drive heads, etc. Bulletin 76.
237a International Engrg.

Mixers Company makes available Confidential Mixing Data Sheet. Helpful checklist enables you to develop a complete technical description of agitation required for your process, quickly & easily. No. B-107.
201b Mixing Equipment Co.

Mixers Turbo-Mixers for the fermentation industry. Bulletin includes typical Turbo 200 hp fermenter design. Turbo seed tank agitator with vertical drive, Turbo extractor with vertical drive, etc. No. 211.
430C General American Trans.

Mixers Mix-Mullers for chemical and process industries. Covers Simpson mulling principle: mulling for dry, wetted and plastic mixtures; Mix-Mullers for special requirements; etc. 12 p. Bulletin No. 522.
344 National Engrg. Co.

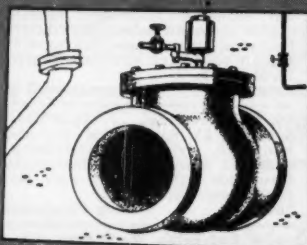
Mixers New—broad in application—standardized for low cost. Four different models, for propeller, turbine, gas absorber and other mixing elements. Complete details in fact-filled Unimixer Bulletin.
131 Patterson Foundry & Mach.

Mixers Shear-Flow incorporates all desirable features for mixing textile colors. It not only mixes, but it disperses solid pigment colors in various clears or extenders. Offers full details on new mixer line.
430D Gabb Special Products Div.

Mixers, Dry Describes conical blenders (design, operation, application, capacity, sizes & specifications) & ribbon mixers (operating & construction features, specifications, etc.) Illustrated Bulletin No. 78.
237g International Engrg.

modernize YOUR PLANT WITH **G-A SOLENOID VALVES**

WHICH CAN BE
OPERATED
LIKE THIS



✓ or by many other types of
electrical impulse

✓ Use the angle body and
save the price of an elbow
fitting

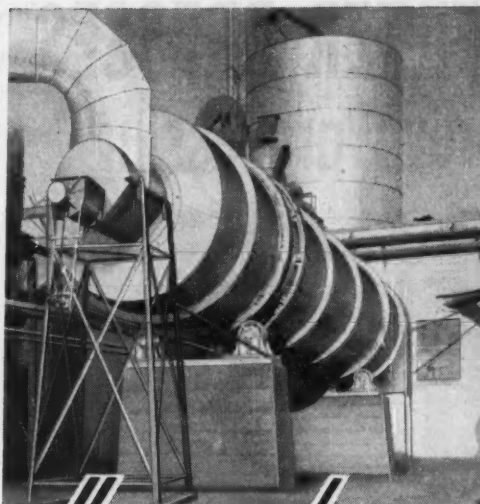
✓ Positive Control

✓ Sizes 1/2" thru 36"

✓ Used on Water, Oil, Air
and Many Other Liquids

**BULLETIN W-7 HAS THE
TECHNICAL FACTS
WRITE FOR IT TODAY**

**GOLDEN
ANDERSON**
Valve Specialty Company
1203 RIDGE AVE., PITTSBURGH 33, PA.
Designers and Manufacturers of
VALVES FOR AUTOMATION



Honeyfeed uses **DAVENPORT ROTARY AIR COOLER**

10'-0" diameter x 50'-0" long. Davenport Rotary Air Cooler operating
on soy bean meal at the Mankato, Minnesota Plant.

If you have a de-watering or cooling problem, let us send you our
complete, illustrated catalog.

For quick reference, see your 1954 or 1955 Chemical Engineering
Catalog. A.

davenport MACHINE and
DAVENPORT, IOWA
U. S. A. **FOUNDRY COMPANY**

DAVENPORT

De-Watering
and Cooling
Equipment
ROTARY
Steam Tube,
Hot Air and
Direct Fire
Dryers

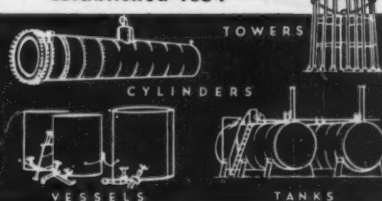


TEN YEARS before the BATTLE OF ATLANTA

In 1854, ten years before the Battle of Atlanta,
we started out as a small iron-works. Many com-
munities and many mills secured their first elevated
tanks for water supply from us. For the privilege
of celebrating our Centennial, we express our ap-
preciation for the friendship of four generations of
customers, and the loyalty of four generations of
workers.

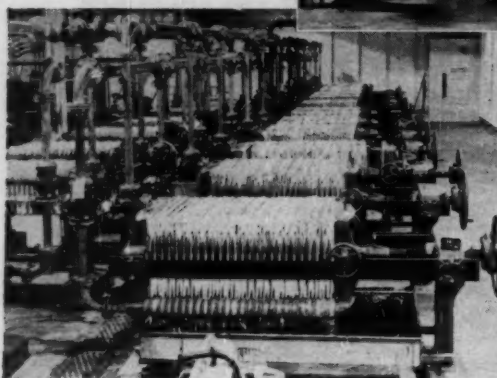
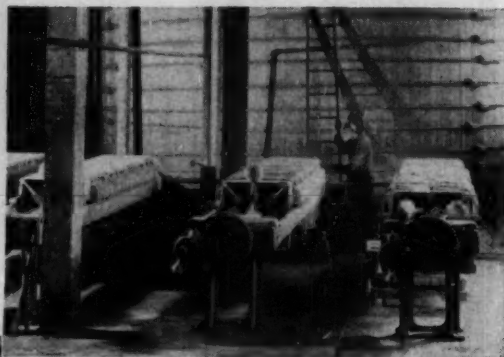
R. D. COLE
MANUFACTURING CO.
NEWNAN, GA.

Established 1854



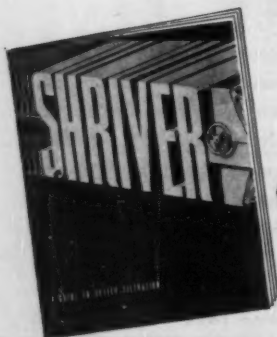
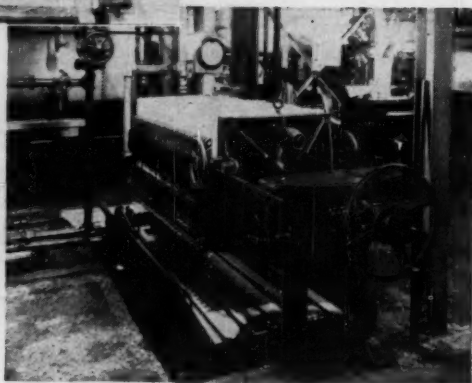
JOBS for FILTER PRESSES that improve processing

Recovery of firm filter cake free of soluble salts as in this Shriver installation for colors and pigments. The presses are equipped with individual outlet cocks for controlling flow of wash water to individual filter chambers.



Filtration of viscous materials as in this battery of Shriver filter presses for rayon, which permit using inexpensive, throw-away filter medium, reducing operating costs.

Filtration requiring high degree of clarity, as in the purification of edible oils in this Shriver filter press, where filter paper or pads are conveniently used.



There are many other applications where Shriver filter presses help the problem of cutting operating costs or improving product quality. The new issue of the Shriver Book gives you plenty of information, suggestions and aids. Get a copy... free.

T. SHRIVER & COMPANY, INC.

802 Hamilton St., Harrison, N. J.

Filter Presses • Filter Media • Diaphragm Pumps

Marco Centrifugal Co.
San Francisco 7, Calif.

Process Eng. & Equip. Co.
St. Louis 19, Mo.

The Walls Co.
Houston, Tex.

Richardson Agencies, Ltd.
Montreal, Que.

LITERATURE . . .

Mixers, Laboratory Laboratory mixers: electric motor driven, direct drive, variable speed and geared models. Air motor driven models also available. Provides complete details in Bulletin No. DH-50.
201c **Mixing Equipment Co.**

Mixers, Portable Details on chemical & ceramic laboratory equipment. Includes data on portable mixers, ribbon mixers, jaw crushers, blungers, filter presses, jar mills, jars, etc. Illustrated Bulletin No. 77-A.
237b **International Engr.**

Mixers, Portable Use in industry reduces costs, saves time, labor and secures better and more refined products. Catalog includes data on construction, dimensions, specifications, etc. 28 p. No. B-102.
201d **Mixing Equipment Co.**

Mixers, Side Entering The Type "NU" side entrance mixer is a brand new unique mixer design. It has no cast parts and is of all welded construction, including the stuffing box. Illustrated Bulletin No. 72-A.
237e **International Engr.**

Mixers, Side Entering Furnishes detailed information on features, typical applications, mechanical design, maintenance, shaft seals, methods of installation, etc. in completely illustrated Catalog No. B-104.
201e **Mixing Equipment Co.**

Mixers, Top Entering Makes available pertinent information on top entering mixers (propeller type) . . . for close tanks, pressure & vacuums . . . for open & loose-covered tanks. Data in Catalog B-103.
201f **Mixing Equipment Co.**

Mixers, Top Entering Information on top entering propeller mixers. Includes data on selection, construction features, sizes & specifications of high & slow speed top entrance mixers, etc. Bulletin 73.
237d **International Engr.**

Mixers, Top Entering Illustrated and detailed 32 p. Catalog includes advantages, typical installations, mechanical description, construction information, dimensions and selection tables, etc. No. B-102.
201g **Mixing Equipment Co.**

Mixing & Extrusion Machinery Covers company line of Vac-Aire de-airing pug mills . . . for pottery, floor tile, electric porcelain. Includes schematic drawing showing construction details. 8 p. Bulletin 62-A.
237e **International Engr.**

Propellers Data Folder describes smooth, vibrationless propellers for stirring, mixing, aerating, etc. Balanced to avoid whip and strain on shafts. In a wide variety of metals, and in sizes up to sixty inches.
BR310 **Michigan Wheel Co.**

Pulverizers Valuable data on Super-fine pulverizer . . . a centrifugal air attrition impact pulverizer and classifier in a single unit. Covers numerous features, specifications, construction, etc. Illustrated.
6a **Schutz-O'Neill Co.**

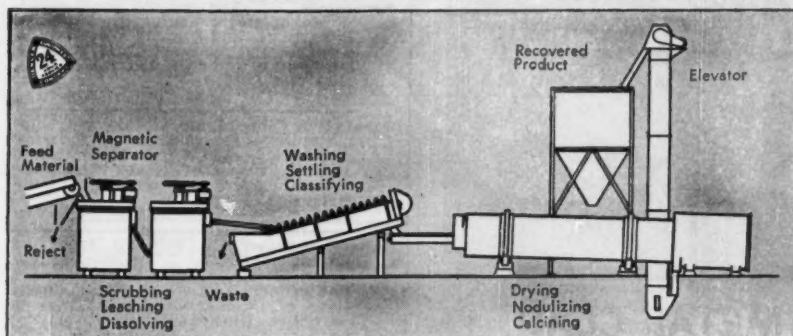
Pulverizers Accessibility—simplicity—compactness—features of new design, which make Ray-Ducer so easy & economical to use for producing various grades of powdered materials. Bulletin offers full details.
278 **Raymond Div.**

Reclamation Systems Denver reclamation systems take dollars out of your wastes—if you have valuable materials in your wastes, these systems can make recovery profitable. Catalogs & Brochures on request.
TL433a **Denver Equipment Co.**

Samplers Covers automatic sampling & its application to many different problems. Includes specifications, detailed data, charts, photographs, etc. which graphically describe samplers. 12 p. Bulletin S1-B4.
432A **Denver Equipment Co.**

Denver Reclamation Systems

take dollars out of your wastes



If you have valuable materials in your wastes, Denver Reclamation Systems can make recovery profitable. Also, present reclamation systems can be economically modernized.

- Complete testing, engineering and design services.
- Wet or dry systems.
- Complete fabrication facilities.
- Catalogs and Brochures on Request!

DECO can supply engineering, laboratory testing, process development and equipment for crushing, grinding, concentration, separation and recovery, settling, filtering, drying and related processes. Also, complete line of laboratory equipment.

DENVER PHONE CHerry 4-4466

The Firm That Makes Its Friends Happier, Healthier and Wealthier



DENVER EQUIPMENT COMPANY

1400 SEVENTEENTH STREET • DENVER 17, COLORADO

New York, Chicago, El Paso, Salt Lake City, Toronto, Vancouver, London, Johannesburg, Mexico, D. F.

FOAM'S A THIEF



KILL IT *with* DOW CORNING ANTIFOAM AF EMULSION

Now you're the boss! Foam no longer dictates productive capacity, output or processing times as witness these examples:

- strawberry concentrate cooling time reduced 25%.
- dairy saves 300-400 gallons of skimmed milk daily.
- yield on textile vat dyes doubled.
- vacuum concentration capacity increased 60%.

Effective at remarkably low concentrations against the widest variety of foamers, Dow Corning Antifoam A and the more easily dispersed Antifoam AF Emulsion are physiologically harmless; pay for themselves many times over because they • **eliminate the waste and fire hazard of boil-overs** • **reduce processing times** • **save the space previously wasted on foam in process equipment**

see for yourself!

mail coupon TODAY for
free sample

DOW CORNING SILICONES	
Dow Corning Corporation Midland, Mich., Dept. 2602	
Please send me data and a free sample of	
<input type="checkbox"/> Dow Corning Antifoam A	
or <input type="checkbox"/> Dow Corning Antifoam AF Emulsion	
NAME _____	
COMPANY _____	
ADDRESS _____	
CITY _____	ZONE _____ STATE _____

OLDBURY

1896

ALKYL ACID PHOSPHATES

(ALKYL PHOSPHORIC ACIDS)

Partial List • Light color to colorless

1. Methyl Acid Phosphate
2. n-Butyl Acid Phosphate
3. Amyl Acid Phosphate
4. Iso Octyl Acid Phosphate
5. Lauryl Acid Phosphate

These and other alkyl acid phosphates including mixed alkyl acid phosphates are available in quantities ranging from experimental to semi-commercial.

Technical information and samples on request.

OLDBURY

ELECTRO-CHEMICAL COMPANY

Executive Offices:

NIAGARA FALLS, NEW YORK

Sales Office:

19 RECTOR STREET, NEW YORK 6, N. Y.

Plants:

NIAGARA FALLS, N. Y. COLUMBUS, MISS.

WHAT IS "CERAMO"?



Ceramo

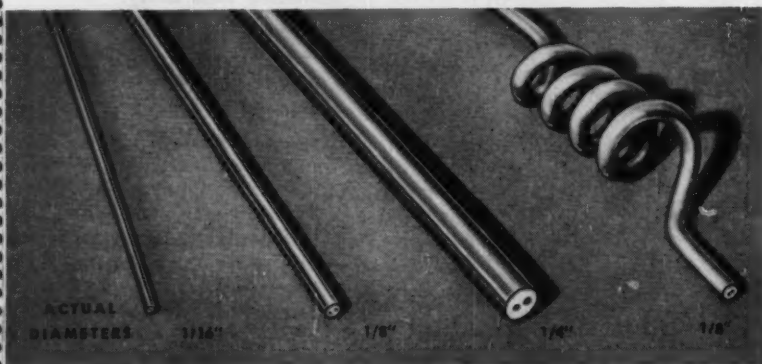


**HI-TEMP, METAL CLAD
THERMOCOUPLE WIRE.**

T-E's "Ceramo" wire consists of thermocouple material conductors, surrounded by magnesium-oxide insulation, with seamless metal tubing overall.

Thermocouples or extensions made of "Ceramo" wires will fit into openings that are too small for most ordinary thermocouples or extensions. Furthermore, they can be formed easily to any configuration without short-circuiting—in fact, "Ceramo" can be bent on a radius as small as its own diameter. The durability of the outer metal tube makes conduits unnecessary. Not even a hammer blow will injure it; in fact, it will withstand pressures up to 40,000 psi. These metallic clad wires have excellent resistance to high temperature, moisture, chemicals, petroleum products, atomic radiation or abrasion.

"Ceramo" thermocouple wires are made in Iron-Constantan, Chromel-Alumel, Copper-Constantan, Chromel-Constantan, and Platinum-Rhodium Platinum. Wires are sheathed with seamless tubing of stainless steels, Inconel, aluminum, or copper. Made with 30, 22 and 16 gage conductor material; overall diameters of 1/16", 1/8", and 1/4" respectively; lengths up to 30 ft.



"Ceramo" thermocouple extension wires are made in Iron-Constantan, Chromel-Alumel, or Copper-Constantan with copper-nickel alloy, plain or galvanized cold drawn steel sheath overall. Made with 20 and 16 gage conductor material; overall diameters of 1/8" and 1/4" respectively; lengths up to 2000 ft., depending on the type of metal tubing and outside diameter. "Ceramo" is made also in single conductors or multi-conductor cables.

Interested? Write for bulletin 31-300-E.

Pyrometers • Temperature Monitoring Systems • Thermocouples • Protection Tubes
Quick-Coupling Connectors and Panels • Thermocouple and Extension Wires

Thermo Electric Co., Inc.

SADDLE RIVER TOWNSHIP, ROCHELLE PARK POST OFFICE, NEW JERSEY
IN CANADA—THERMO ELECTRIC (Canada) Ltd., BRAMPTON, ONTARIO

LITERATURE . . .

Separators. You can use liquid separators in steam distillations, solvent extractions, and organic reactions in chemical and pharmaceutical processing. Full details in Bulletins Nos. SC-1044 and S-1010.
69 Selas Corp. of America.

Separators, Centrifugal. Rugged, simple centrifugal separator . . . for continuous concentration or classification of bulky suspended solids. Construction, applications, operation, etc. in Bulletin No. 3053.
434A Merco Centrifugal Co.

Sifters, Gyrator. Sift all types of ground material . . . spices, drugs, herbs, chemicals, etc. Covers information on construction, operating directions & specifications, & includes a parts list. Illustrated.
6b Schutz-O'Neill Co.

Washers, Pulp. Data on Swenson recovery equipment for pulp mills—illustration, description and discussion of pulp washers, explaining the advantages of advanced engineering features. Bulletin No. E-108.
7h Swenson Evaporator Co.

Washers, Screw. Offers new Bulletin on cleaning, dewatering, classifying sand and other coarse or fine materials—with single or double screw washers. Includes data on models, capacities, sizes, etc.
304 McLanahan & Stone Corp.

Pumps, Blowers, Compressors

Calculators, Vacuum. Company presents device designed for rapid slide-rule calculations. Includes a standard ABCD log scale. Helps to determine the proper pump to be installed for a specific process.
36b F. J. Stokes Mach. Co.

Compressors. Illustrated, 22 p. covers valuable information on company's new turbocharged, two-cycle, right angle, gas-engine-driven compressors. Three sizes: 2000 bhp, 2350 bhp, 3300 bhp. Bulletin 134.
434B Clark Bros. Co.

Compressors, Oil-Free. Offer space-saving design, excellent service, economical operation, etc. Company builds regular and oil-free compressors to meet any capacity and pressure need. Bulletin No. A-44.
8 Joy Mfg. Co.

Compressors-Pumps. For low foundation costs, low maintenance and smooth, pulsation-free air flow, use modern rotary compressors and vacuum pumps. Units are compact, self-contained. 12 p. Bulletin No. 16B8126.
91 Allis-Chalmers Mfg. Co.

Fans. Exceptional fan equipment for industrial air & material handling features: high efficiency; rugged, tight construction; 3 interchangeable wheels—each with radial blades; etc. Illustrated Bulletin 702.
58 Clarage Fan Co.

Fans, Axial. Presents to industry a most complete line of axial fans featuring the utmost in efficiency and performance. Specifications, capacities, performance curves, etc. in illustrated, 32 p. Bulletin 108-A.
4340 International Engrg.

→ Want more information on any of these items? Just circle its code number on the postcard inside the back cover, then mail to us. It's that easy now.

Fans & Boosters..... Describes line of stack fans & duct boosters. Includes information regarding advantages, applications, details of construction, dimensions, capacities, etc. In 16 p. illustrated Bulletin No. 109-A.
2377 International Engrg.

Pumps..... Combining motor & pump in a single unit, Chemump is the most significant advance in pump design in half a century. Hard-to-handle fluids can't leak or become contaminated. 16 p. Bulletin No. 1010.
208-9 Chemump Corp.

Pumps..... Handle most anything that can pass thru a pipe, from free-flowing liquids to non-pourable pastes—even materials containing relatively large particles or abrasives. Moyno Pump Bulletin No. 30C.
315 Robbins & Myers.

Pumps..... Information on the number of rings, depth of box, type of packing... chemical & physical properties of fluid being pumped speed of shaft, & other usable facts, in Pump Bulletin No. S-147.
L303 Taber Pump Co.

Pumps, Acid..... On most difficult pumping jobs... dependable, highly efficient pumps deliver continuous, trouble-free performance on "round-the-clock" schedules wherever they are installed. Full details.
215 A. R. Wilsey & Sons.

Pumps, Centrifugal..... Features & advantages of company line of centrifugal pumps. Includes engineering information, performance curves, capacity charts, seal application, etc. In illustrated Catalog 253.
82b Tri-Clover Div.

Pumps, Centrifugal..... Impervious graphite pumps feature mechanical seal with enclosed coolant, rugged type SN armored connections, interchangeable parts, wide capacity range, etc. Catalog Section S-7250.
219a National Carbon Co.

Pumps, Centrifugal..... In a given pump size, new standard units give at least 108 different combinations, plus maximum resistance to corrosion, erosion, cavitation. Offers complete details on new 1750 rpm pumps.
75 Ampco Metal.

Pumps, Chemical..... Controlled capacity chemical pumps designed to meet the practical requirements of low initial cost, operating and maintenance economy. Details of line and Selection Chart in Bulletin S-1254.
L310 Phila Pump & Machy. Co.

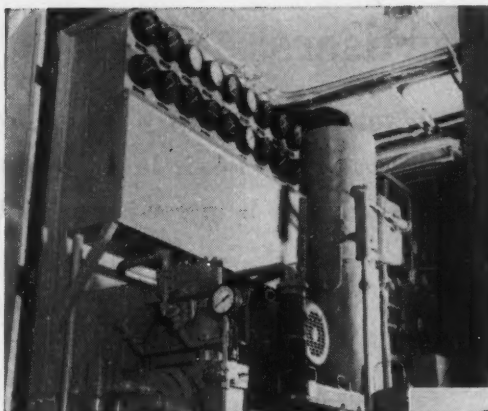
Pumps, High Vacuum..... Cites examples of typical vacuum systems using high vacuum pumps, and provides solutions to various problems in pump selection, in completely revised product brochure, Catalog No. 700.
36a F. J. Stokes Mach. Co.

Pumps, Process..... De Laval CPO processed pumps handle numerous liquids: salt brine; sea water; caustic solution; soap solution; etc. Capacities to 2000 gpm—heads to 200 ft. Details in Bulletin No. 1125-B.
153 DeLaval Steam Turbine Co.

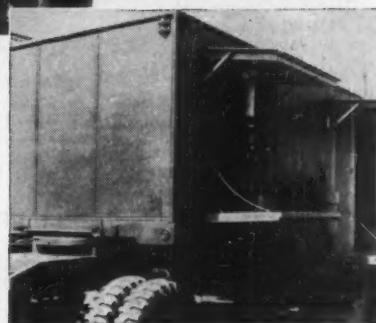
Pumps, Slurry..... Slurry pumps handle extremely thick slurries with high specific gravities. Provide long operating life with little or no maintenance. Covers features and selection data in Bulletin 181.
288 Morris Mach. Wks.

Pumps, Vacuum..... High vacuum gas handling without moving parts are features of single stage steam jet vacuum pumps. Includes application, construction, operation, performance data, etc. In Bulletin No. 5-E.
435A Schutte & Koerting Co.

Pumps, Vacuum..... Valuable suggestions on installation, starting, servicing, trouble-shooting, & helpful "do's" & "don't's" on vacuum pumps & vacuum pumping systems, in fully detailed Bulletin No. 755.
36c F. J. Stokes Mach. Co.



An interior and exterior view of a mobile trailer unit fitted with a CO₂ generator manufactured by the Gas Equipment Engineering Corp.



For rugged, trouble-free Refrigeration used in MOBILE CO₂ PLANTS



An adequate and dependable supply of carbon dioxide for fire fighting equipment is a vital standby need at airports, military installations, and industrial plants.

One of the outstanding mobile units engineered to meet these requirements is the special trailer unit fitted with a carbon dioxide generator manufactured by the Gas Equipment Engineering Corp. of Mount Vernon, New York. Through catalytic action this portable unit furnishes in the field a ready supply of carbon dioxide liquid, as well as hydrogen. Important components of this design are the Vilter 7½ hp condensing unit and the Vilter low temperature carbon dioxide liquefier.

The flexibility and reliability of the Vilter units made them a natural choice for this job. Everywhere in industry Vilter is known for its Quality products... designed for efficient operation... requiring a minimum of maintenance—both helping to reduce operating costs. For help in your designs, check with Vilter.

Vilter.

Your nearby VILTER Representative or Distributor will be glad to show you how VILTER refrigeration can help you.

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, MILWAUKEE 7, WIS.

Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water and Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice and Polarflake Ice Machines

Index to Advertisers

Month after month you'll find industry's most progressive firms among our ad pages. Use this index to keep in touch with what they're offering that'll help you in your job.

Air Preheater Corp.	157
Airetool Mfg. Co.	406
Allegheny Ludlum Steel Corp.	332
Allen-Bradley Company	374
Allied Chemical & Dye Corp.	
General Chemical Div.	109
Nitrogen Div.	321, 341
Solvay Process Div.	147
Allis-Chalmers Mfg. Co.	
General Machinery Div.	91, 251
	261, 271
Tractor Division	97
Alloy Fabricators Div. of Continental Copper Industries, Inc.	419
Alloy Steel Products Co.	359
Alsop Engineering Corp.	419
Aluminum Company of America	
Chemicals Division	339
American Air Filter Co.	
Roto-Clone Dust Control Div.	348
American Brass Co., The	39
A.C.F. Industries, Inc.	
Industrial Products Div.	59
American Chain & Cable Co.	
Helicoid Gage Div.	289
American Cyanamid Co.	20-21
American Flange & Mfg. Co.	229
American Hard Rubber Co.	404-405
American Machine & Metals Inc.	
DeBothezat Div.	207
Niagara Filter Div.	203
Tolhurst Div.	205
American Optical Co.	377
American Platinum Works, The	403
American Wheelabrator & Equip. Corp.	318
Ampco Metals Inc.	75
Anthracite Equipment Corp.	421
Appleton Electric Co.	94
Armstrong Cork Co.	35
Armstrong Machine Works	382
Atlantic Metal Hose Co., Inc.	269
Atlas Powder Co., Darco Dept.	74
Avondale Marine Ways Inc.	
Service Foundry Div.	429
Babcock & Wilcox Co.	
Process Equipment Dept.	138-139
Tubular Products Div., Fittings Dept.	367
Bailey Meter Company	50
Baker Chemical Co. J. T.	26-27
Baldwin-Hill Co.	282
Barco Mfg. Co.	439
Barksdale Valves	
Pressure Switch Div.	285
Bemis Bro. Bag Co.	409
Bethlehem Steel Co.	
Forged Products Div.	264
B.I.F. Industries, Inc.	
Omega Machine Co.	88
Bird Machine Co.	11

Black, Sivalls & Bryson, Inc.	
Climax Controls Div.	101
Blaw-Knox Co.	
Buflovak Equipment Div.	151
Equipment Div.	293
Power Piping and Sprinkler Div.	81, 298
Boardman Co., The	408
Bridgeport Brass Co.	365
Brookfield Engineering Lab. Inc.	310
Brown Co.	410
Brown & Root, Inc.	117
Buell Engineering Co.	257
Buffalo Forge Co.	352
Buffalo Meter Co.	407
Buffalo Pumps Inc.	364
Calumet & Helca, Inc.	
Wolverine Tube Div.	36a&b
Cambridge Wire Cloth Co.	290
Carbide & Carbon Chemicals Co. div. of Union Carbide & Carbon Corp.	143
Carpenter Steel Co.	
Alloy Tube Div.	351
Carrier Conveyor Corp.	259
Catalytic Construction Co.	34
Celcote Co., The	411
Celanese Corporation of America	233
Century Electric Co.	77
Chapman Valve Co.	323
Chase Brass & Copper Co.	350
Chemical Construction Corp., A Unit of American Cyanamid Co.	319
Chemical & Industrial Corp., The	65
Chemical & Power Products Inc.	362
Chempump Corp.	208-209
Chemsteel Construction Co.	386
Chicago Bridge & Iron Co.	131
Clarage Fan Co.	58
Clark Equipment Co.	37
Cleaver-Brooks Co.	43
Cleveland Vibrator Co.	441
Cochrane Corp.	317
Cole Mfg. Co., R. D.	431
Colton Co., Arthur	421
Columbian Bronze Corp.	386
Combustion Engineering Inc.	
Raymond Pulverizer Div.	278

Commercial Solvents Corp.	145
Consolidated Engineering Corp.	292
Continental Copper & Steel Industries, Inc.	
Alloy Fabricator Div.	419
Coper Alloy Corp.	307
Coppus Engineering Corp.	52
Crane Co.	277
Crane Packing Co.	356
Croll-Reynolds Engineering Co.	263
Crucible Steel Co. of America	
Stainless Steel Div.	45
Darco Dept. Atlas Powder Co.	74
Darling Valve & Mfg. Co.	335
Davenport Machine & Foundry Co.	431
Day Co.	239
De Laval Steam Turbine Co.	153
Deming Co., The	414
Dempster Bros., Inc.	22-23
Denver Equipment Co.	433
Dings Magnetic Separator Co.	363
Dodge Mfg. Corp.	28-29
Dorr-Oliver, Inc.	106-107
Dow Corning Corp.	433
Dowell Inc.	71
Duraloy Co.	413
Durametallic Corp.	421
Duriron Co.	221
Eastern Industries Inc.	85
Eastman Kodak Co.	
Industrial Photographic Div.	156
Edwards Valves Inc.	366
Eimco Corp., The	125
Enjay Co., Inc.	135
Eriez Mfg. Co.	84
Esso Standard Oil Co.	253
Farris Engineering Corp.	30-31
Flexitallic Gasket Co.	276
Fluor Corp. Ltd., The	347
Foster Wheeler Corp.	129
Foxboro Co.	54
Frick Co., Inc.	64
Frontier Industries Inc.	
Manzel Div.	423
Fuller Co., The	100
General American Transp. Corp.	211
General Chemical Div. Allied Chemical & Dye Corp.	109
Gerotor May Corp.	305
Girdler Co.	2nd Cover
Glycerine Producer's Assoc.	241
Golden-Anderson Valve Specialty Co.	431

Sales Representatives

Atlanta 3	W. D. Lanier, 1321 Rhodes-Haverly Bldg., Walnut 5778-2823
Boston 16	W. D. Boyd, 350 Park Square Bldg., Hubbard 2-7160
Chicago 11	D. Gridley, J. M. Rodger, Jr., 520 N. Michigan Ave., Mohawk 4-5800
Cleveland 15	L. J. Biel, 1510 Hanna Bldg., Superior 1-7000
Dallas 1	James Cash, First National Bank Bldg., Prospect 7-5064
Detroit 26	L. J. Biel, 856 Penobscot Bldg., Woodward 2-1793
Los Angeles 17	Jos. H. Allen, 1111 Wilshire Blvd., Madison 4-4323
New York 36	R. G. Frederick, J. E. Tuohig, 330 West 42 St., Longacre 4-3000
Philadelphia 3	E. M. Schellenger, Architects Bldg., 17th & Sansom Sts., Rittenhouse 6-0670
Pittsburgh 22	G. S. Ryan, 719 Oliver Bldg., Atlantic 1-4707
San Francisco 4	John W. Otterson, 68 Post St., Douglas 2-4600
St. Louis 8	J. M. Rodger, Jr., 3615 Olive St., Continental Bldg., Lucas 4867

Goodrich Co., B. F. (Geon)....	12
Goulds Pumps Inc.	418
Great Lakes Carbon Corp.	
Dicalite Div.	331
Grinnell Co., Inc.	16
Gustin-Bacon Mfg. Co.	57

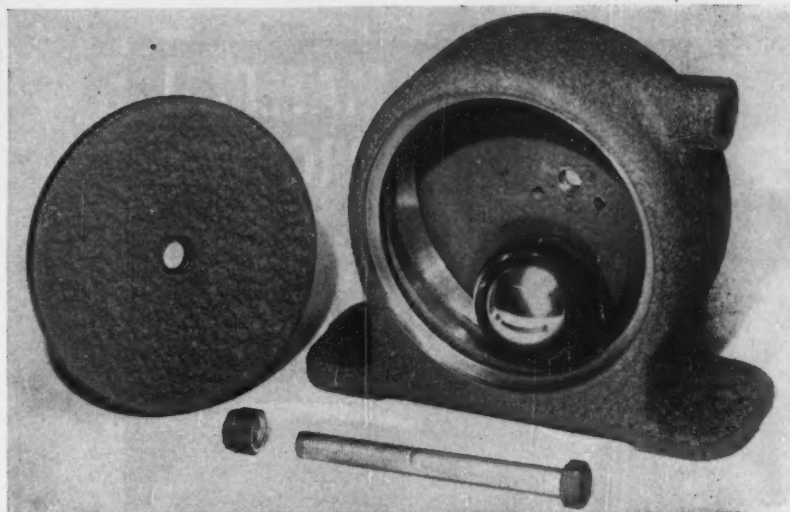
Hapman Conveyors Inc.	438
Hardinge Co.	444
Harshaw Chemical Co., The...	266
Hartwell & Son Inc., H. N.	284
Henszey Co.	441
Hercules Powder Co.	78
Hewitt-Robins, Inc.	224-225
Hillard Corp., The.	281
Hills-McCanna Co.	416
Hooker Electrochemical Co.	150
Frank G. Hough Co.	216-217

Illinois Testing Laboratories, Inc.	324
Illinois Water Treatment Co.	443
Independent Engineering Co.	338
Industrial Filter & Pump Mfg.	
Co.	376
Industrial Process Engineers.	320
Infilco, Inc.	309
Ingersoll-Rand Co.	89
International Engineering Co.	237
International Nickel Co.	55
International Paper Co.	328

Jeffrey Mfg. Co.	90
Jelliff Mfg., The C. O.	368
Jenkins Bros.	337
Jerguson Gage & Valve Co.	375
Johns Manville Corp.	
Celite Filter Aids Div.	141
Packings & Gaskets.	76
Joy Mfg. Co.	8

Kaiser Aluminum & Chemical	
Corp. Sales Inc.	
Kaiser Chemicals Div.	345
Keasbey & Mattison Co.	60
Kellogg Co., The, M. W.	
Chemical Mfg. Div.	14-15
Kemp Mfg. Co., C. M.	306
Kennedy Car Liner & Bag Co.	343
Kerrigan Iron Works, Inc.	420
Walter Kidde & Co., Inc.	280
Kieley & Mueller Inc.	46
Kinney Mfg. Co.	358
Kirk & Blum Mfg. Co., The...	415
Klinger Limited, Richard.	243
Koppers Co., Inc.	
Chemical Div.	417
Engineering & Construction	
Div.	270
Koven & Bros. Inc., L. O.	332

LaBour Co., Inc., The.	61
Ladish Co.	
Tri-Clover Div.	82
LaFavorite Rubber Mfg. Co.	362
Lapp Insulator Co.	
Porcelain Process Div.	96
Lawrence Pumps Inc.	422
Layne & Bowler, Inc.	63
Lebanon Steel Foundry.	51



new airoviber moves bulk materials, quickly, quietly, and effectively...

AiroViber simple design provides dependable, trouble-free vibration

This new method of external vibration can be used to good advantage in loading, unloading, moving, packaging, processing, grading or separating bulk materials.

The AiroViber is able to deliver effective and dependable vibration with only one moving part, a heavy steel ball running on a circular track. The pounding usually associated with the ordinary types of vibration has been eliminated with the special noise lessening design, exclusive with AiroViber.

Simplified Design: AiroViber's one moving part is a steel ball. An air jet blows it at high speed around a ground and hardened steel track in the housing. The weight of the ball develops a strong centrifugal force, which the vibrator transmits through its mounting into the object to be vibrated. It will start and operate under any condition and performs at high or low temperatures. AiroViber is not affected by humidity.

Trouble-Free Operation: The AiroViber is almost fool proof in operation. Because it has no close fitting parts to lubricate or adjust, it will start every time you open the air valve. You can install it in hard to get at locations with full confidence

that it will operate without lubrication or maintenance for a long time.

No Installation Problems:

AiroViber is easy to install. It does not need any special line oilers or air filters. Merely hook up an air hose large enough to deliver the air specified for the unit you select.



AiroViber rotary vibration breaks up arching and jamming in bins, hoppers, chutes, feeders, and other places where bulk materials hang up. It is also recommended for vibrating tables or platforms, sorting and many other applications.

AiroViber is a product of the Viber Company, leader in the field of vibration. For further information, write: Viber Company, 726 South Flower St., Burbank, Calif. CE72

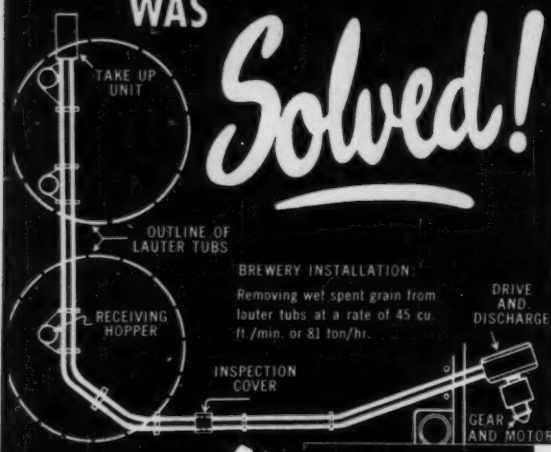


CONCRETE VIBRATORS SINCE 1931

HOW ONE MATERIAL HANDLING PROBLEM

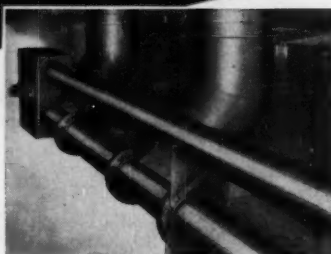
WAS

Solved!



WITH A **Hapman**
TUBULAR CONVEYOR

"Very satisfactory service" says brewery of this liquid-tight Hapman Tubular Conveyor which carries spent grains from two lauter tubs. This view shows discharge spouts and take-up end.



IF YOU HANDLE WET OR DRY FLOWABLE FOOD PRODUCTS, CONSIDER THESE UNIQUE HAPMAN ADVANTAGES:

1. *Interior sanitation*—no pockets or corners to catch contaminating particles. Self-cleaning design features.
2. *Exterior sanitation unexcelled*—conveyors are liquid-tight, dust-tight, odor-tight and safe.
3. *Operate in any plane or angle*—around corners and obstructions without transfer points. Multiple feed and discharge points.
4. *Minimum clearance needed*—tubing is largely self-supporting. Better appearance, too!
5. *Amazingly low power cost*—low maintenance as well. Quiet in operation.
6. *Engineered to your specific requirements*—fully proved in plants now handling starch, flour, malt, ground fish, meat products and other foods.

GET FULL DETAILS

Send sketch or describe your problem. Our engineers will cooperate fully. AND REQUEST YOUR COPY OF BULLETIN CE-255



ADVERTISERS . . .

Lee Metal Products Co.	296
Leeds & Northrup Co.	17
Link Belt Co.	13, 38, 72
Liquidometer Corp., The	343
Litton Engineering Laboratories	419
Lukens Steel Co., Clad Steels	340
Lummus Co.	115
Lunkenheimer Co., The	40-41

Mallinckrodt Chemical Works	334
Manheim Mfg. & Belting Co.	49
Manning, Maxwell & Moore, Inc.	385
Manton-Gaulin Mfg. Co.	361
Marietta Concrete Corp.	231
Marley Co., The	9
Master Electric Co., The	3rd cover
McGraw-Hill Book Co.	368
McLanahan-Stone Corp.	304
McNally-Pittsburg Mfg. Corp.	424
Metals Disintegrating Co., Inc.	
Pulverizing Machinery Div.	330
Merrick Scale Mfg. Co.	386
Metalweld Inc.	386
Michigan Wheel Co.	310
Midvale Co., The	223
Midwest Piping Co., Inc.	308
Miller & Son Inc., Franklin P.	386
Mine Safety Appliances Co.	93
Minneapolis Honeywell Regulator Co.	
Industrial Div.	154-155
Mission Mfg. Co.	69
Mixing Equipment Co.	201
Monarch Mfg. Co.	373
Morris Machine Works	288
Murray Mfg. Co., D. J.	370

Naresco Equipment Corp. Subsidiary of National Research Corp.	381
Nash Engineering Co.	66
National Carbon Co.	219
National Engineering Co.	344
National Lead Co.	123
National Pneumatic Co.	
Automatic Door Div.	300
National Radiator Co.	
Heat Transfer Div.	425
New England Tank & Tower Co.	349
Newport News Shipbuilding and Dry Dock Co.	326
New York State Dept. of Commerce	360
Niagara Alkali Co.	315
Niagara Blower Co.	373
Nicholson & Co., W. H.	127, 321
Nitrogen Div., Allied Chemical & Dye Corp.	321, 341
Nooter Corp.	119
Norton Co.	247
Norwalk Co.	355

Oldbury Electro Chemical Co.	433
Omego Machine Co., Div. of B.I.F. Industries, Inc.	88
Oronite Chemical Co.	133
Owens Corning Fibreglas Corp.	381

Pangborn Corp. Dust Control..	301
Patterson Foundry & Machine Co.	121
Patterson Kelley Co., Inc.	105
Peerless Mfg. Co.	283
Pennsylvania Flexible Metallic Tubing Co. Inc.	316
Perkin-Elmer Corp., The.	227
Pfaudler Co.	Back Cover
Pfizer & Co., Charles.	265
Philadelphia Gear Works Inc.	98
Philadelphia Pump & Machinery Co. Inc. A subsidiary of American Meter Co.	310
Pittsburgh Corning Corp.	48
Pittsburgh Lectordryer Corp. ...	73
Pneumatic Scale Corp. Ltd.	360
Powell Valves, Wm. Powell Co.	213
Prater Pulverizer Co.	426
Pressed Steel Tank Co.	267
Process Filters, Inc.	295
Proctor & Schwartz, Inc.	370
Pulverizing Machinery Div. Metals Disintegrating Co., Inc.	330
Pyrene-C-O-Two	346

Quaker Oats Co., The Chemical Dept. 297

Raybestos-Manhattan Inc. Manhattan Rubber Div.	353
Packing Division	428
Read Standard Corp. Blower Stoker Div.	299
Rennenberg & Sons, Co.	441
Republic Flow Meters Co.	354
Republic Steel Corp. Steel & Tubes Div.	24-25
Revere Copper & Brass	255
Robbins & Myers, Inc., Pump Div.	329
Rockwell Mfg. Co.	83, 234-235
Roots-Connersville Blower Corp.	427
Ryerson & Sons, Inc. J. T.	158

Sandvik Steel Inc.	333
Saran Lined Pipe Co.	357
Schutz-O'Neill Co.	6
Sealol Corp.	375
Selas Corp. of America	68
Seter Engineering Corp.	443
Sharpley Corp.	137
Shippers Car Line Corp.	149
Shell Chemical Corp.	111
Shriver & Co., Inc., T.	432
Simpson-Mix Muller Div. National Engineering Co. ...	344
Sinclair Chemicals Inc.	327
Subsidiary Sinclair Oil Corp. S. Morgan Smith Co.	287
Socony-Vacuum Oil Co., Inc.	245
Solvay Process Div. Allied Chemical & Dye Corp.	147
Southwestern Engineering Co. ...	358
Sparkler Mfg. Co.	443
Spray Engineering Co.	338
Spraying Systems Co.	343

BARCO Swing Joints



HERE is why users like BARCO'S new all-steel Swing Joints for loading and unloading petro-chemicals, solvents, oil, alcohol, LP gas, and other fluids:

BALL BEARING AND O-RING EQUIPPED—In Barco Swing Joints, the ball bearings do not fall out when joints are taken apart! Long bearing provides adequate pipe support. *Special O-ring seal eliminates frequent gasket replacement.* Seals on pressure or vacuum. Leakproof service over wide temperature range, -40°F. to 225°F.

LONG LIFE—New "Bar-Moly" dry lubricant process gives a permanent anti-galling, corrosive-resistant finish to moving parts. This, combined with routine lubrication, insures longest possible maintenance-free service.

EASY MAINTENANCE—Joints can be disassembled for inspection without disconnecting piping. O-rings are easily renewable in the field. Frequent greasing not required to maintain sealing.

MANY STYLES—The Barco line is complete with single swing, double swing, and counter-balance styles to meet every need. Sizes 2", 2½", 3", 4".

BARCO MANUFACTURING CO.

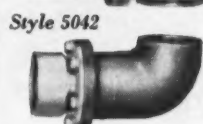
516C Barrington, Illinois
Worldwide Sales and Service



Style 5041



Style 5047



Style 5042



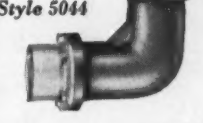
Style 5049



Style 5040



Style 5044



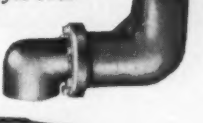
Style 5045



Style 5048



Style 5050



Style 5046



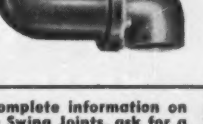
Style 5043



Style 5041



Style 5047



Style 5042

For complete information on Barco Swing Joints, ask for a copy of Catalog 400, Bulletin 26.

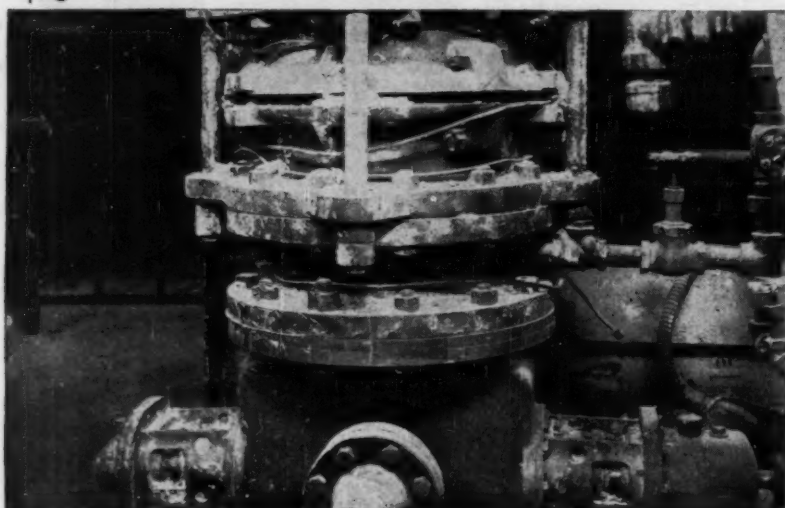
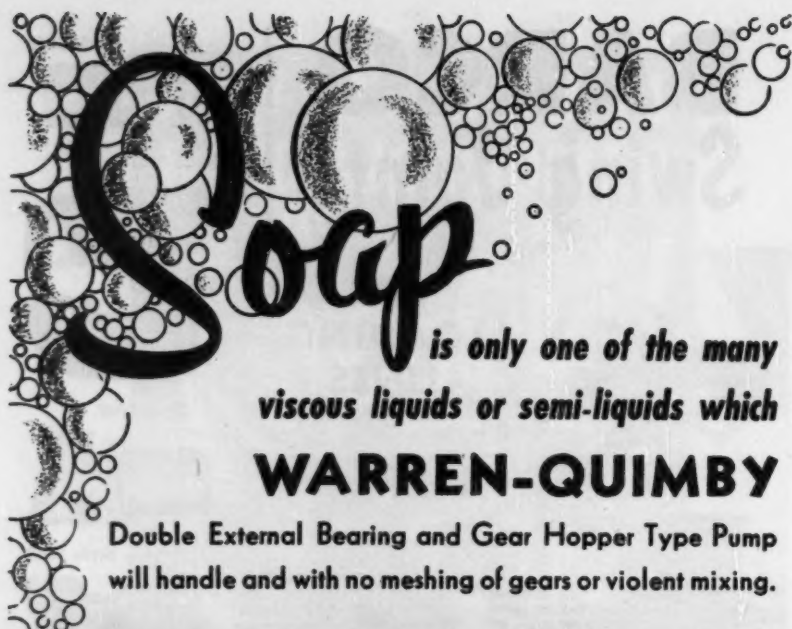


Photo: Courtesy of Lever Brothers Company
Warren-Quimby Hopper Type Screw Pump handling soap mixture.

Such materials, for instance, as acetates, dopes, tar, sludges, chewing gum, tooth paste, chicle, food products and other items where a short, unobstructed suction opening must be provided, can be satisfactorily pumped. Also, these pumps handle applications requiring the filtering of viscous liquids at pressures up to 1000 p.s.i.

It will pay you to ask for Bulletin S-206, which gives the mechanical details, etc., of this highly specialized type of Rotary Pump.



CO-7

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.

Warren, Massachusetts

ADVERTISERS . . .

Sprout, Waldron & Co. Inc. . . .	67
Standard Oil Co. (Indiana) . . .	56
Stanley Co., Inc. W. W.	362
Stephens Adamson Mfg. Co. . . .	383
Stokes Machine Co., F. J.	36
Strahman Valves, Inc.	338
Struthers Wells Corp.	99
Sturtevant Mill Co.	342
Superior Combustion Industries Inc.	366
Surface Combustion Corp.	
Kathabar Div.	70
Heat Treatment	355
Swenson Evaporator Div.	
Whiting Corp.	7

Taber Pump Co.	303
Taylor & Co., W. A.	364
Taylor Forge & Pipe Works. . . .	87
Taylor Instrument Cos.	18-19
Tennessee Corp.	303
Texas Gulf Sulphur Co.	372
Thermo Electric Co., Inc.	434
Toledo Scale Co.	378
Trane Co., The	42
Tranter Mfg. Inc.	
Platecoil Div.	86
Traylor Engineering & Mfg. Co. . .	249
Tri-Clover Div. Ladish Co.	82
Tube Turns A Div. of Natural Cylinder Gas Co.	379-380
Turbo-Mixer Div. of General American Transportation Corp. . .	211
Turner & Haws Engineering Co. . .	324
Twin Disc Clutch Co.	356

Uehling Instrument Co.	386
U. S. Electrical Motors, Inc. . . .	79
U. S. I. Industrial Chemicals Co.	311-312
U. S. Gasket Co.	286, 294
U. S. Rubber Co., Mechanical Goods	371
U. S. Steel Corp. Stainless.	32-33, 53
U. S. Stoneware Co., The.	102

Viber Co.	437
Viking Pump Co.	324
Vilter Mfg. Co., The.	435
Virginia Gear & Machine Corp. . .	98
Virginia Smelting Co.	47
Vogt Machine Co., Henry.	325
Vulcan Iron Works	92

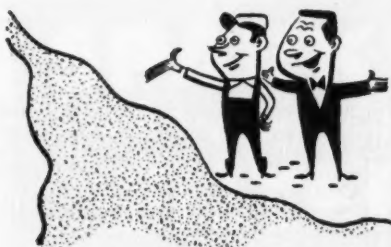
Wagner Electric Corp.	268
Wallace & Tiernan Co., Inc. . . .	442
Wall Colmonoy Corp.	430
Walworth Co., The	95
Warren Steam Pump Co.	440
Wiedeke Co., Gustav.	386
Welding Fittings Corp.	10
West End Chemical Co.	62
Weston Electrical Instrument Co.	44
Wilfley & Sons, Inc., A. R. . . .	215

The case of
the frustrated
cement...



In a Chicago cement block plant a short time ago, production was really at a standstill. Try as it would, the frustrated cement just trickled through the hoppers and bins instead of flowing along steadily.

But a CLEVELAND vibrator solved the problem. In short order the trickle of cement increased to a flood.



And, we might add, production really got moving too.

Tell us your materials handling problem, or ask for our detailed literature.

AIR *and* ELECTRIC



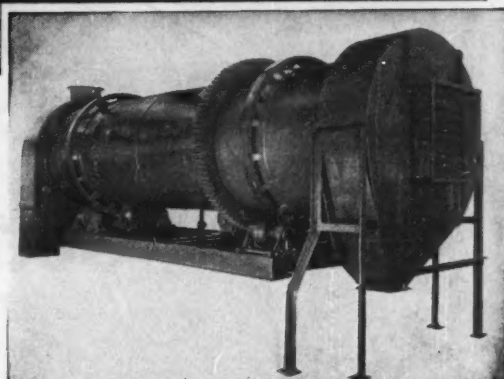
2866 Clinton Avenue • Cleveland 13, Ohio

CHEMICAL ENGINEERING—February 1955

COOLERS

For All Materials

- Chemicals
- Fertilizers
- Food Products
- Metals
- Plastics



One of a battery of 5 Renneburg coolers, specially designed and manufactured for fertilizer plants located in Iowa, Maryland, Michigan, Ohio and Tennessee. Each unit handles 25 tons per hour . . . incorporates highly efficient shelf design for quick thermal release, with special feed and discharge breechings. Coolers rotate on large steel trunion wheels equipped with self-aligning, anti-friction bearings. Rotary seals prevent air losses. For Dryers and Coolers tailored to your specific needs, contact Renneburg—pioneer dehydration engineers and manufacturers for over 75 years.

EDW. RENNEBURG & SONS CO.

BALTIMORE 24, MARYLAND, U. S. A.

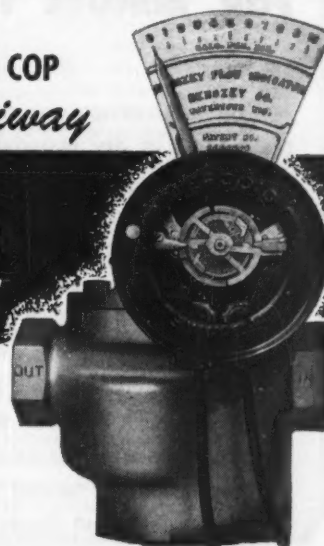
CONTINUOUS COOKERS, PRESSES, COOLERS, EVAPORATORS • OIL BURNERS • DEODORIZING EQUIPMENT

A FULL TIME TRAFFIC COP
on your fluid hiway

**HENSZEY
FLOW METERS**
with Alarm Control

**RINGS A BELL—LIGHTS A LIGHT or
ACTIVATES a MOTORIZED VALVE**

There are only three moving parts in the HENSZEY FLOW METER — no breakdown due to complicated gears and mechanism. Goes right in the line — no additional supports. Indicates flow within 3% absolute accuracy, even with pulsating flow. Send for bulletin.



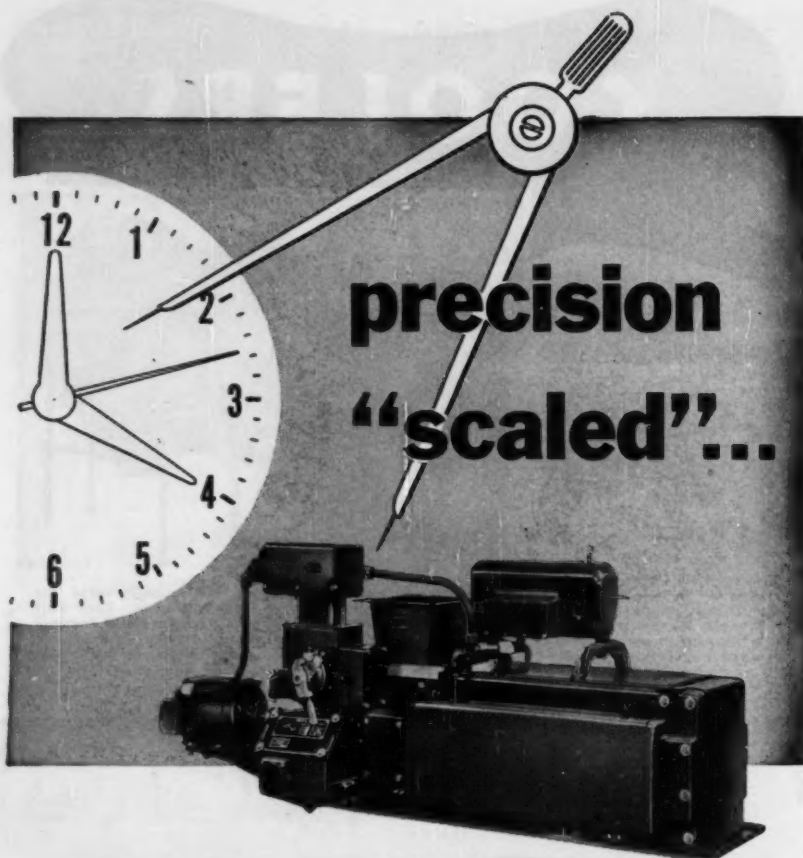
**SOUND ALARM AT
HIGH OR LOW FLOW!**

Easy to set on face of switch — unaffected by dust, dirt or corrosion — no pitting or sticking.

HENSZEY COMPANY

DEPT. E2

WATERTOWN, WISCONSIN



FOR MINUTE TO MINUTE ACCURACY

Minute to minute accuracy in the feeding of dry materials — uniform delivery to reaction tanks, continuous blending, or batch mixing — is a requisite for maintaining uniformly high quality in final products, in modern chemical processing operations.

W & T Merchen Scale Feeders which weigh and feed in one operation ensure this exacting accuracy. Precision "scaled", durably constructed and simply controlled, the Feeder weighs all

material and immediately compensates by weight for variations in density, moisture content, etc. Whether feeding ounces or pounds per hour, the pre-set rate of feed is continually and automatically maintained.

If you have a processing problem requiring uniform feeding of dry materials, accurately controlled by weight, communicate with Wallace & Tiernan. You'll receive prompt attention without obligation.

M-21

WALLACE & TIERNAN

COMPANY, INC.

NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

Williams Patent Crusher & Pulverizer Co. 80
Williams & Co., Inc., C. K. ... 302
Worthington Corp.
Air Conditioning & Refrigeration Div. 336

Yarnall-Waring Co. 152
Youngtown Welding & Engrg. Co. 291

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

PROFESSIONAL SERVICES 387

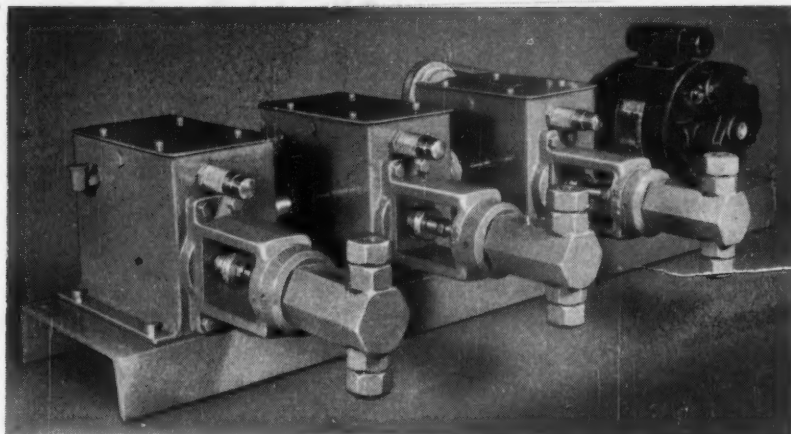
EMPLOYMENT
Positions Vacant 388
Selling Opportunities Offered..... 388
Positions Wanted 388
Selling Opportunities Wanted..... 388
Employment Services 388

SPECIAL SERVICES 388

EQUIPMENT
(Used or Surplus New)
For Sale 389-400

WANTED
Equipment 396
Miscellaneous 396

ADVERTISERS INDEX
Aaron Equipment Co. 394
American Air Compressor Corp. ... 398
Anthracite Equipment Corp. 400
Barcan Co., Irving. 398
Brill Equipment Co. 396, 391
Chemical & Process Machinery Corp. 397
Chemical Service Corp. 400
Consolidated Products Co., Inc. 389, 400
Cowles Chemical Co. 400
Drake Personnel Inc. 388
Edgar Plastic Kaolin Co. 394
Equipment Clearing House Inc. ... 392
First Machinery Corp. 392
Gelb & Son Inc., R. 399
Heat & Power Co., Inc. 396
Instrument Service Engineering
Labs 394
Kehoe Machinery Corp. 398
Lawler Co. 392
Loeb Equipment Supply Co. 396
Loeb & Son, H. 398
Luria Bros. Co., Inc. 394
Machinery & Equipment Co. 394
Machinery & Equipment Corp. ... 396
Meyer & Son Inc., Wm. W. 397
Neu Corp., Hugo. 398
Newman Tallow & Soap Machy. Co.,
Inc. 398
Pangborn Corp. 388
Perry Equipment Corp. 393
Process Plants Service Inc. 394
Stanhope Inc., R. C. 398
Stein Equipment Co. 396
Strickler Engineering Corp. 395
Truland Chemical & Eng. Co. 388
Union Standard Equipment Co. ... 394
Vulcan Defining Co. 392
Weinstein Co. 400



SETER CHEMICAL PUMPS

★ Designed for accuracy, the new Model 20 Chemical Proportioning Pump is precision built for handling acids and alkaline solutions. A recent addition to our line of chemical pumps, it will give uninterrupted service for long periods of time. Many other models to select from. Write for complete details.

SETER ENGINEERING CORPORATION
7626 WEST FLORIST AVE. MILWAUKEE 16, WISCONSIN

SPARKLER HORIZONTAL PLATE FILTERS



For fine filtering with positive cake stability, Sparkler tops them all

The smooth even filter aid pre-coating on a Sparkler horizontal plate can be applied very thin, as the slurry can be floated over the plates at low pressure and deposited with no danger of voids. Flow is always with gravity. This thin precoat saves filter aid and permits actual filtering to start sooner than with vertical plates where pressure is required to hold the cake on the plate.

Only on a horizontal type plate can this thin pre-coat be accomplished with safety.

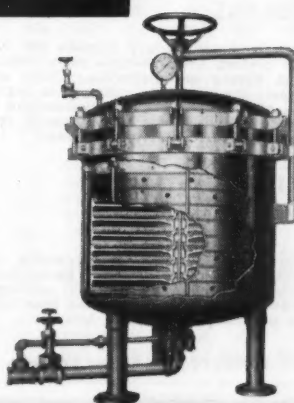
Any kind of filter paper or filter aid can be employed with maximum efficiency. Extremely fine filtering can thus be obtained without restricting the flow rate as would be encountered with a heavy uneven pre-coat.

Fine filtering of chemicals and pharmaceuticals is much easier and more positive with Sparkler horizontal plate filters.

SPARKLER MANUFACTURING CO., MUNDELEIN, ILL., U.S.A.

Sparkler International Ltd.

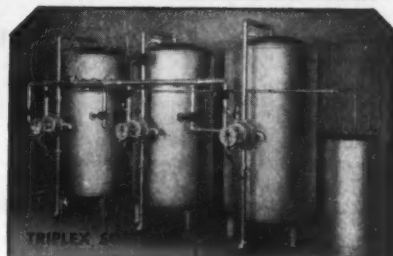
Plants at Galt, Ontario, Canada, Amsterdam, Holland



Standard Horizontal
Plate Filter

Write Mr. Eric Anderson
for personal service

ILICO-WAY
ionXchange



HOW TO GET GOOD SOFT WATER OFTEN CALLS FOR EXPERIENCED ENGINEERING

With the advent of modern ion-exchange resins about 20 years ago, the familiar problem of softening "hard" water has found a number of new and interesting solutions. For one thing, the new resins have many times the capacity of the old greensands and zeolites. (Simply putting one of the new ILLCO-WAY Resins in your old softener may show a surprising saving.) For another thing, up-to-date knowledge of the available resins, and how best to use them, can lead to some interesting improvements in the degree and manner of softening, and may also provide valuable collateral achievements in the same process. Satisfying results are best obtained from EXPERIENCE such as we have gained as pioneers and specialists in the field. We have been making successful applications of modern ion-exchange methods ever since the year the new resins were introduced. Please tell us your wishes, and let us offer a suggestion.

ILLINOIS WATER TREATMENT CO.

ionXchange



844 CEDAR ST.
ROCKFORD,
ILLINOIS

NEW YORK OFFICE: 141 E. 44TH ST., NEW YORK 17, N. Y.
CANADIAN DIST. PUMPS & SOFTENERS, LTD. LONDON, ONT.

Ruggles-Coles

DRYERS, KILNS & COOLERS

DOUBLE-SHELL SEMI-DIRECT HEAT DRYERS



Class XA—This Ruggles-Coles double-shell, direct-heat Dryer has the highest thermal efficiency, and consequently the lowest fuel consumption, of any rotary dryer manufactured. It is particularly adapted to the drying of coal.

DOUBLE-SHELL INDIRECT-HEAT DRYERS



Class XB—A double-shell, indirect-heat rotary dryer designed to handle such materials as kaolin, chalk, whiting, china clay, pigments, fuller's earth, etc., which cannot be dried by direct heat on account of possible injury from the products of combustion. The dust loss is very low. High thermal efficiency.

SINGLE-SHELL COUNTERFLOW DRYERS



Class XF—Single-shell, counter-flow dryer for high drying temperatures. Dried material discharges before passing through the furnace.

STEAM TUBE DRYERS



Class XC—A rotary steam dryer with steam pipes on the inside of the shell that rotate with it. Especially adaptable for drying materials that are injured by high temperature, such as brewers' grain, cotton seed, starch feed, tobacco stems, corn germs, etc.

SINGLE-SHELL PARALLEL-FLOW DRYERS



Class XH—This is a single-shell, parallel-flow dryer, especially designed to handle flotation concentrate without sticking and without excessive dust loss. It has a high thermal efficiency and dries any sticky organic or inorganic material quite economically.

HOT AIR DRYERS



Class XW—The Class XW Dryer is used almost exclusively for drying inorganic salts and similar materials. It is a single-shell dryer with steam coil heating element, usually placed at discharge end of dryer.

ROTARY COOLERS



Ruggles-Coles Rotary Coolers are employed for cooling hot materials after high-temperature drying or calcination. There are three types: the air type, utilizing an induced cool air stream; the partially submerged type (illustrated); and the water spray type with exterior sprays cooling the shell.

ROTARY KILNS



For small capacity requirements, Hardinge offers the Ruggles-Coles horizontal Rotary Kiln for continuous calcining, roasting or oxidizing operations. It may be fired by oil, gas or pulverized coal.

Write for Bulletin AH-438-11. Please supply details of your drying problem.

HARDINGE

COMPANY, INCORPORATED

YORK, PENNSYLVANIA • 240 Arch St. • Main Office and Works
New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco

Editorial Reprints . . .

● Processes and Costs

- 1 Chemical Engineering's Flowsheets—150 process flowsheets (\$2).
- 2 Cost Estimation I—38 articles, 128 pp. of data (\$1.75).
- 3 Cost Estimation II—12 articles, 48 pp. Apr. '52-Feb. '53 (\$1).
- 48 Cost Estimation III—17 articles, 80 pp. Mar. '53-May '54 (\$1.25).
- 52 Heat Exchanger Design—Lucid instruction & help, 40 pp. (75¢).
- 56 Cost Index—Subject index to 351 cost estimating articles (50¢).

● Feature Reports

- 4 Fluid Flow—15 authoritative articles (\$1).
- 17 Sublimation—Review of a little-known unit operation (50¢).
- 21 Pumps—How to select chemical pumps (50¢).
- 22 Process Instrumentation—48-p. report and 16-p. chart (\$1).
- 25 Size Reduction—Covers crushing, grinding and pulverizing (50¢).
- 26 Petrochemical Processes—Data on 23 major processes (50¢).
- 28 Solids Feeders—How to lick feeding difficulties (50¢).
- 33 Fluidized Solids—Timely survey of fluidization know-how (50¢).
- 34 Heat Technology—Heat production, transport and transfer (\$1).
- 36 Strain Gages—How to use for controlling process variables (50¢).
- 37 Entrainment Separation—Equipment and performance (50¢).
- 40 Process Piping—Roundup of piping, valves, fittings (75¢).
- 41 Plants & Processes—New plants and technology (75¢).
- 46 Conveyors & Elevators—Solutions to bulk moving problems (50¢).
- 47 Mixing—Understand this universal operation, 48 pp. (75¢).
- 50 Lubrication—Of chemical equipment, for plant engineers (50¢).
- 53 Engineering With Models—Both scale and test models (50¢).
- 54 Binary Distillation—Theory, equipment (75¢).
- 55 Ion Exchange—A chronicle of remarkable advances (75¢).

● Materials of Construction

- 29 Protective Coatings—How to select, use against corrosion (\$1).
- 35 Industrial Plastics—How and where to use (50¢).
- 38 Stainless Steels—Properties and corrosion data (75¢).
- 43 Hastelloys B,C,D—Combined Corrosion Forum reprint (75¢).
- 58 16th Biennial Report—64 p. review of corrosion resistance (\$1).

● CE Refresher Series

- 42 Thermodynamics Principles—First installment of series (50¢).
- 45 Compression & Expansion—Fundamental review (50¢).
- 49 Chemical Equilibrium—(50¢).
- 57 Homogeneous Kinetics—(50¢).

Order Now:

Use your reader service postcard for the fastest delivery. Pay when billed.



Attention NON-SUBSCRIBERS:

Why Be Just Another Name on a Magazine Circulation List...When You Can Have Your Own Copy of CE for Less Than a PENNY A DAY?

JUST A PENNY A DAY—yet today it could have brought you the personal use of all the information contained in this issue. Information so helpful, in fact, that many thousands of chemical engineers invite it into their homes every month.

Just think . . . with your own copy of **CHEMICAL ENGINEERING**, there's no waiting for each issue to reach you, no need to hurry it along. You can clip articles for your files . . . the entire issue is yours, as personal as your newspaper. .

Why Wait? Use the handy coupon below to order your personal subscription to CHEMICAL ENGINEERING today!

No need to send any money now. We'll bill you later.

TO SUBSCRIBE:

1. How many years? ☐
2. About your company ☐
3. HOME mailing, address if you prefer ☐

BE SURE TO FILL OUT OTHER SIDE OF CARD BEFORE MAILING

**KEY
NUMBERS**
Circle
for more
information
about

- ADS
- EQUIPMENT
- PRODUCTS
- SERVICES
- LITERATURE

and

FLASHBACK ITEMS

(See page 411)

TO ORDER REPRINTS

Indicate quantities for each
(See page 444)

FOR CHANGE OF ADDRESS

(Give both old and
new addresses)

Old ☐
Address

New ☐
Address

New Subscription Form:

Domestic Rates only. For all others, see p. 5 1 Year \$3 ☐; 2 Years \$4 ☐; 3 Years \$5 ☐
Product or service No. employees approx.

Street:	City:	State:
2 26-7b 65 88 181f 201b 241 280C 310 321 344 412M 416C 438 L431		
6a 26-7c 67a 89 135 203 242A 251a 290 322a 345a 412N 416D 438A TR431		
6b 26-7d 67b 90a 135 205 242B 251b 291 322b 345b 412O 416E 438B BR431a		
6c 28-9 67c 90b 137 208-9 242C 251c 292 323 345c 413 416F 438C BR431b		
6d 30-1a 67d 90c 138-9a 211 242D 252A 293 TL324 345d 413A 416G 438D BR431c		
6e 30-1b 67e 90d 138-9b 212 243a 252B 294 BL324 345e 413B 416H 438A 432a		
6f 30-1c 68 90e 140A 215 243b 252C 295a R324 345f 413C 416I 424B 432a		
7a 23-3 69 90f 141 216-7 243c 253 295b 325a 346 413D 416J 424C 432b		
7b 24 70 91 142A 216a 243d 255 295c 325b 348 413E 416K 424D TL433a		
7c 25 71 92a 143a 216b 243e 257 295d 325c 349a 413F 417 424E TL433b		
7d 36A-Ba 72 92b 143b 219e 243f 259 295a 326 349b 413G 417A 424F TL433c		
7e 36A-Bb 73 92c 143c 219d 244A 261 296b 327a 350 413H 417B 424G BL433a		
7f 36a 74 92d 143d 219e 244B 263 296c 327b 351 413I 417C 424H BL433b		
7g 36b 75 93a 144A 219f 244C 265a 297 327c 353 413J 417D 424a BL433c		
7h 36c 76 93b 144B 219g 244D 265b 298 328 355 413K 417E 424b BL433d		
7i 27 77 94 144C 223 244E 265c 299 329a L355 414 417F 425 BL433e		
8 28 78a 95 146A 224-5a 245 265d 300 329b R355 414A 417G 426a BL433f		
9 29 78b 96 146B 224-5b 246A 266a 302 329c L364a 414B 417H 426 R433		
10 40-1 78c 97 146C 224-5c 246B 266b L303 329d L364b 414C 417I 426A 424		
11 42 78d 98 147 224-5d 246C 266c R303 329e L364c 414D 417J 426B 434A		
12a 43 78e 99 148A 224-5e 246D 267 304 329f L364d 414E 418 426C 434B		
12b 44 79f 100 148B 224-5f 246E 268 305 329g R364 414F 418A 426D 434C		
12c 45 79 101a 148C 227 247a 269 306 330 353 414G 418B 427A 435		
12d 46 80a 101b 148D 229 247b 270 307a 331a 354 414H 418C 427B 435A		
13 47 80b 101c 148E 231 247c 271 307b 331b 403 414I 418D 427a 437		
14-5 48 80c 101d 148F 233 247d 276 308 332 406 414J 418E 427b 438		
16 49 80d 101e 148G 234-5 247e 277a 309 333a 407 414K 418F 427c 439		
14-5 48 80c 101d 148F 233 247d 276 308 332 406 414J 418E 427b 438		
16 49 80d 101e 148G 234-5 247e 277a 309 333a 407 414K 418F 427c 439		
17 50 80e 101f 148H 235A 247f 277b L310 333b 408 414L 418G 427d 440		
20-1a 61 81 102 149 247a 248A 277c TR310 335 409 415 L419 427e L441		
20-1b 82 82a 105 150 237b 248B 277d BR310 336 410 415A TR419 427f TR441		
20-1c 83 82b 100 151 237c 248C 278 311-2a L335 411 415B BR419 427g BR441		
20-1d 84 83a 111 153 237d 248D 280 311-2b TR338 412A 415C 420 428 442		
20-1e 85 83b 115 154-5 237e 248E 281 315 BR338 412B 415D 420A 428A TL443		
20-1f 87 84a 117 156 237f 249a 282 316 339 412C 415E 420B 428B BL443		
20-1g 88 84b 121 157 237g 249b 283 317 340 412D 415F 420C 428C R443		
20-1h 89 84c 123 158 237h 249c 284 318 341 412E 415G 420D 429 444a		
20-1i 90 84d 125 162 237i 249d 285 320a 342a 412F 415H 420E 429A 444b		
20-1j 91a 85a 137 201a 237j 249e 286a 320b 342b 412G 416I TL421 429B 444c		
22-3 91b 85b 139 201b 237k 249f 286b 320c 342c 412H 416J BL421 430 444d		
24-5a 92 85c 131a 201c 238A 249g 286c 320d 342d 412I 415K R421 430A 453a		
24-5b 93a 85d 131b 201d 238B 249h 286d 320e TL343 412J 416 422 430B 453b		
24-5c 93b 85e 131c 201e 239 280A 287 320f BL343 412K 416A 422A 430C 454a		
24-5d 93c 86 131d 201f 240A 280B 288 320g R343 412L 416B 422B 430D 454b		
27-7a 94 87 131e 201g		

(Card expires May 1)

138A	142A	144A	144D	144G	144J	254A	254D	255B	256E	259B	260A	260D	262C	264B
140A	142B	144B	144E	144H	248A	254B	254E	255C	256F	259C	260B	262A	262D	264C
140B	142C	144C	144F	144I	252A	254C	254F	255A	256D	259A	260C	262B	264A	264D

1	2	3	4	17	21	22	25	26	28	29	33	34	35	36	37	38
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40	41	42	43	45	46	47	48	49	50	52	53	54	55	56	57	58
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Street:	City:	State:
Street:	City:	State:

For PRODUCTS and SERVICES

not specifically advertised in this issue, consult your . . .

Chemical Engineering **Inventory Issue**

Published in Mid-September 1954, it is your annual guide to all major recent developments in . . .

CHEMICALS • EQUIPMENT • SERVICES

FIRST CLASS
PERMIT No. 64
(Sec. 34.9 P.L.&R.)
NEW YORK, N. Y.



BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

—4¢ POSTAGE WILL BE PAID BY—

CHEMICAL ENGINEERING

READER SERVICE DEPARTMENT

330 WEST 42nd ST.

NEW YORK 36, N. Y.

USE YOUR
READER
SERVICE
FOR MORE
INFORMATION
ABOUT

- Advertised Products
- Product News
- Equipment News
- New Literature
- Reprints
- . . . and even for
- Change of Address

PLEASE TYPE OR PRINT

Name _____
Position _____
Company _____
Address _____
City & State _____

Attention NON-SUBSCRIBERS:

Why Be Just Another Name on a Magazine Circulation List...When You Can Have Your Own Copy of CE for Less Than a PENNY A DAY?

JUST A PENNY A DAY—yet today it could have brought you the personal use of all the information contained in this issue. Information so helpful, in fact, that many thousands of chemical engineers invite it into their homes every month.

Just think . . . with your own copy of **CHEMICAL ENGINEERING**, there's no waiting for each issue to reach you, no need to hurry it along. You can clip articles for your files . . . the entire issue is yours, as personal as your newspaper.

Why Wait? Use the handy coupon below to order your personal subscription to CHEMICAL ENGINEERING today!

No need to send any money now. We'll bill you later.

TO SUBSCRIBE:

1. How many years? →
2. About your company →
3. HOME mailing address if you prefer →

BE SURE TO FILL OUT OTHER SIDE OF CARD BEFORE MAILING

KEY NUMBERS
Circle for more information about

- ADS
- EQUIPMENT
- PRODUCTS
- SERVICES
- LITERATURE

and

FLASHBACK ITEMS (See page 411)

TO ORDER REPRINTS

Indicate quantities for each
(See page 444)

FOR CHANGE OF ADDRESS

(Give both old and new addresses)

Old →
Address

New →
Address

New Subscription Form:

Domestic Rates only. For all others, see p. 5 1 Year \$3 ☐; 2 Years \$4 ☐; 3 Years \$5 ☐

Product or service

No. employees approx.

Street:

City:

State:

2	26-7b	68	88	131f	201b	241	250C	289	321	344	412M	416C	423	L431
3a	26-7c	67a	89	133	203	242A	251a	290	322a	345a	412N	416D	423a	TR431
3b	26-7d	67b	90a	135	205	242B	251b	291	322b	345b	412O	416E	423B	BR431a
3c	26-7e	67c	90b	137	206-9	243C	251c	292	323	346c	413	416F	423C	BR431b
3d	26-7f	67d	90c	138-9a	211	242D	252A	293	TL324	346d	413A	416G	423D	BR431c
3e	26-7g	67e	90d	139-9b	213	243a	252B	294	BL324	346e	413B	416H	424A	432A
3f	26-7h	67f	90e	140A	215	243b	252C	295a	R324	346f	413C	416I	424B	432a
3g	26-7i	67g	90f	141	216-7	243c	253	295b	325a	346	413D	416J	424C	432b
3h	26-7j	67h	90g	142A	219a	243d	254	296c	325b	346	413E	416K	424D	TL433a
3i	26-7k	67k	90h	143a	219b	243e	257	296d	325c	346a	413F	417	424E	TL433b
3j	26-7l	67l	90i	143b	219c	243f	259	296e	326	346b	413G	417A	424F	TL433c
3k	26-7m	67m	90j	143c	219d	244A	261	296b	327a	350	413H	417B	424G	BL433a
3l	26-7n	67n	90k	143d	219e	244B	263	296c	327b	351	413I	417C	424H	BL433b
3m	26-7o	67o	90l	144A	219f	244C	265a	297	327c	352	413J	417D	424a	BL433c
3n	26-7p	67p	90m	144B	219g	244D	265b	298	328	353	413K	417E	424b	BL433d
3o	26-7q	67q	90n	144C	223	244E	265c	299	329a	L353	414	417F	425	BL433e
3p	26-7r	67r	90o	146A	224-5a	245	265d	300	329b	R353	414A	417G	425a	BL433f
3q	26-7s	67s	90p	146B	224-5b	246A	266a	302	329c	L354a	414B	417H	425b	R433
3r	26-7t	67t	90q	146C	224-5c	246B	266b	L303	329d	L354b	414C	417I	425A	434
3s	26-7u	67u	90r	147	224-5d	246C	266c	R303	329e	L354c	414D	417J	425B	434a
3t	26-7v	67v	90s	148A	224-5e	246D	267	304	329f	L354d	414E	418	426C	434B
3u	26-7w	67w	90t	148B	224-5f	246E	268	305	329g	R354	414F	418A	426D	434C
3v	26-7x	67x	90u	149C	227	247a	269	306	330	363	414G	418B	427A	435
3w	26-7y	67y	90v	148D	229	247b	270	307a	331a	364	414H	418C	427B	435a
3x	26-7z	67z	90w	149E	231	247c	271	307b	331b	408	414I	418D	427a	437
3y	26-7aa	67aa	90x	149F	233	247d	272	308	332	408	414J	418E	427b	438
3z	26-7ab	67ab	90y	149G	234-5	247e	277a	309	333a	407	414K	415F	427c	439
3aa	26-7ac	67ac	90z	149H	236A	247f	277b	L310	333b	408	414L	418G	427d	440
3ab	26-7ad	67ad	90a	149I	237a	248A	277c	TR310	333c	409	415	L419	427e	L441
3ac	26-7ae	67ae	90b	150	237b	248B	277d	BR310	333d	410	415A	TR419	427f	TR441
3ad	26-7af	67af	90c	151	237c	249C	278	311-2a	L338	411	415B	BR419	427g	BR441
3ae	26-7ag	67ag	90d	152	237d	249D	280	311-2b	TR338	412A	415C	428	428	442
3af	26-7ah	67ah	90e	153	237e	249E	281	312	BR338	412B	415D	428A	428a	TL442
3ag	26-7ai	67ai	90f	154-5	237f	249a	282	312	339	412C	415E	428B	428B	BL442
3ah	26-7aj	67aj	90g	155	237g	249b	283	317	340	412D	415F	428C	428C	R443
3ai	26-7ak	67ak	90h	156	237h	249c	284	318	241	312E	415G	428D	429	444a
3aj	26-7al	67al	90i	157	237i	249d	285	320a	423a	412F	415H	428E	429a	444b
3ak	26-7am	67am	90j	158	237j	249e	286a	320b	423b	412G	415I	TL421	429B	444c
3al	26-7an	67an	90k	159	237k	249f	286b	320c	423c	412H	415J	BL421	429C	444d
3am	26-7ao	67ao	90l	160	237l	249g	286c	320d	423d	412I	415K	R421	429a	453a
3an	26-7ap	67ap	90m	161	237m	249h	286d	320e	TL343	412J	416	423	429B	453b
3ao	26-7aq	67aq	90n	162	237n	249i	286e	320f	BL343	412K	416A	423A	429C	454a
3ap	26-7ar	67ar	90o	163	237o	249j	286f	320g	R248	412L	416B	423B	429D	454b
3aq	26-7as	67as	90p	164	237p	249k	286g	320h						

(Card expires May 1)

128A	142A	144A	144D	144G	144J	254A	254D	256B	256E	256H	256I	256J	256K	256L	256M	256N	256O	256P	256Q	256R	256S	256T	256U	256V	256W	256X	256Y	256Z	
140A	142B	144B	144E	144H	248A	254B	254E	256C	256F	256G	256H	256I	256J	256K	256L	256M	256N	256O	256P	256Q	256R	256S	256T	256U	256V	256W	256X	256Y	256Z
140B	142C	144C	144F	144I	232A	254C	254F	256D	256H	256I	256J	256K	256L	256M	256N	256O	256P	256Q	256R	256S	256T	256U	256V	256W	256X	256Y	256Z	256Z	

1	2	3	4	17	21	22	25	26	28	29	33	34	35	36	37	38
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40	41	42	43	45	46	47	48	49	50	52	53	54	55	56	57	58
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Street:	City:	State:
Street:	City:	State:

P.S. Did you miss anything in this issue?

Here's a list to help you make a quick check:

Chementator 103

What's Happening in ...

Gas Synthesis 113
No Radiation Injuries 114
Estimating Dryer Costs 120
Polyethylene 124
Beat the Softwood Shortage 126

SO₂ Absorber: Two Scrubs 132

Chemicals & Raw Materials
Corrosion Fighter ... 140
Index 142

Feature Report

Photochemical Engineering.
By C. M. Doede and C.
A. Walker 159

Feature Articles

Specialize? By H. T. Sharp 179

Distillation Nomographs.
By F. Rodriguez.. 182
Next Award Winner. 184
Gas Turbines For Process
Use — II. By Benjamin
Miller 187
Getting at Your Handling
Costs. By G. A. Smith 193

CE Refresher

Catalytic Vapor Phase Reactions—II. By Thomas
E. Corrigan 195

Plant Notebook

How to Make Flowsheet
Easier Reading. By I. Rodriguez L. and T. Garcia
B 202

You and Your Job

You've a Spot in Non-Chemical Industries. By
S. Ricklin 210

Corrosion Forum

Acid-Truck Painting Cost
Cut 85% 218

Tomorrow's Technology

Resin Production ... 226
Phthalic Anhydride.. 228
Thermal Diffusion .. 230
Your Checklist 232

Equipment News

New Impeller 236
Index 238
Water Cone Cleaner. 240

Chemical Economics

Chemicals Make Cars 254
Consumption Index. 256
Odor Chasers..... 258

Pictured Flowsheet

Methyl Ethyl Ketone 272

Other Departments

Advertisers Index .. 436
Book Reviews 288
Convention Calendar. 128
Firms in the News.. 298
Man of the Month.. 279
Names in the News.. 280
New Technical Literature 412
Reader Service 401
Recent Pamphlets .. 296

FIRST CLASS

PERMIT No. 64
(Sec. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

—4¢ POSTAGE WILL BE PAID BY—

CHEMICAL ENGINEERING

READER SERVICE DEPARTMENT

330 WEST 42nd ST.

NEW YORK 36, N. Y.

PLEASE TYPE OR PRINT

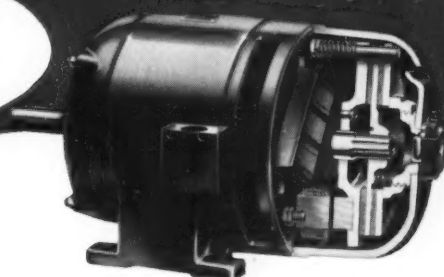
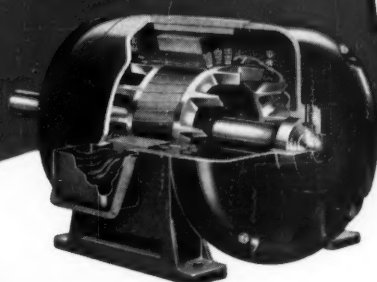
Name _____
Position _____
Company _____
Address _____
City & State _____ 2

AND here is the Reader Service postcard that speeds more information to you.

only



offers you a choice



DYNAMIC UNIBRAKE MOTORS

In Master Type D Unibrakes, dynamic braking is obtained with a unique, patented brake winding superimposed on the stator winding of any Master single phase or polyphase AC induction motor. This provides dynamic braking for AC motors with no outside source of DC current required.

ADVANTAGES. Type D, Dynamic Unibrakes are very simple and compact, and as the brake has no moving parts, there is nothing to wear . . . nothing to adjust . . . braking torque remains uniform.

SIZES. Now available up to 30 horsepower . . . larger ratings are being developed. Master Gearmotors and variable speed drives can also be supplied with Type D Unibrakes.

MAGNETIC UNIBRAKE MOTORS

Type M Unibrakes have electro-magnetic brakes of the friction disc type built into a continuation of the motor end cover, on the end opposite the regular shaft projection. Electric brake and motor form a compact, integral unit.

ADVANTAGES. Type M Unibrakes are ideal for applications where quick or controlled stopping is required. They are particularly desirable on such applications as elevators, hoists, inclined conveyors, etc. where it is necessary to hold the load.

SIZES. Available from $\frac{1}{8}$ to 150 horsepower and for practically any type Master motor. Master Gearmotors and variable speed drives can also be supplied with Type M Unibrakes.

Corrosioneering News

Quick facts about the services and equipment Pfaudler offers to help you reduce corrosion and processing cost.



HAIR-SPLITTING TEMPERATURE CONTROL

How Pfaudler system heats, cools four separate solutions to $\pm 1^\circ$ accuracy at Sylvania Electric

The problem at Sylvania Electric Products, Inc. was to find a system that would hold four different solutions to within 1° F. of a predetermined temperature. These solutions, which are used in the television tube screening and lacquering process, may be required for use between 55° and 70° at any time, and are supplied to system anywhere from 38° to 78° F.

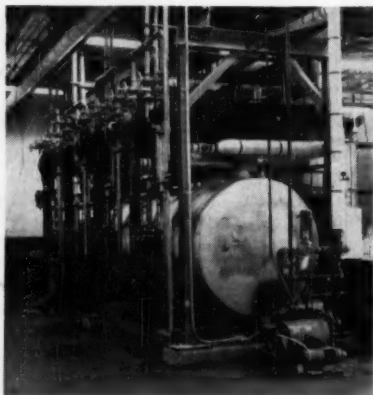
Heats or cools

Thus, the system must either heat the solution or cool it. It must also vary the degree of heating or cooling. And it must switch from heating to cooling, depending upon the change in set point.

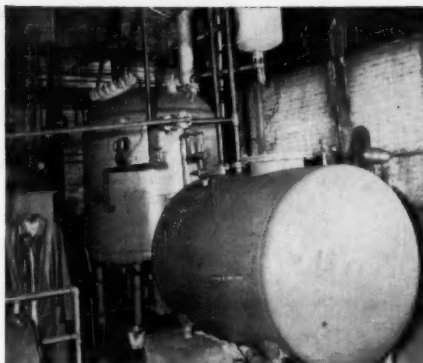
Now in operation at Sylvania's Seneca Falls, N. Y., plant is the Pfaudler system shown below. It does all the thermal gymnastics mentioned above, and still holds to within 1° accuracy on all four solutions.

This system, completely designed and equipped by Pfaudler, includes heat exchangers, all control valves, the heating equipment, refrigeration equipment, automatic controls, panel board and all auxiliary equipment.

If critical temperature control is your problem, a Pfaudler-engineered system may be the most practical solution. Why not give us a crack at your problem? Our representative will be glad to discuss it with you.



Pfaudler system precisely fixes product temperature, heats or cools it as desired; versatile system has wide application wherever accurate temperature control is needed.



Typical recovery system.

Saving about \$2000 every month, a Midwest plating plant now recovers 82.3% of the total chrome used.

The plant is Kilgore, Inc., at Westerville, Ohio. They had been using 3,800 lbs. of new chrome salts a month, treating and discharging the waste. Over a year ago they installed a 500-gal. Pfaudler chrome salt recovery system. They now use 2,000 lbs. new salts and 1,800 lbs. recovered salts, saving the cost of 1,800 lbs. of new salts and the cost of chemicals for treating 3,130 lbs. of waste chrome every month.

Amortized within 6 months

Other companies have installed these standard Pfaudler systems, and have seen them pay for themselves in less than 6 months.

They experience these savings by recovering acids from waste rinse water in plating operations, deriving significant economies in water con-

sumption, and simplification of waste disposal problems.

The Pfaudler system simply evaporates some of the waste water, returning the solution to plating strength. This solution is then piped back to the plating tank, or a storage tank, for reuse. The distilled water obtained by the evaporation process is reused as pure wash water.

The Pfaudler system uses stainless steel for contact with pure water, while acid-resistant glassed steel protects equipment which must resist direct attack by the hot 24% to 45% chromic acid solution.

The Pfaudler "packaged" acid recovery system comes to you complete with detailed instructions for installation and operation. It consists of a still (evaporator), entrainment separator, condenser, and equipment for the accumulation or continuous removal of distilled water condensate.

You pay less for new heat exchangers using both glassed steel and alloys

Handling boiling monochloroacetic acid requires a heat exchanger that shrugs off relentless corrosive action. To meet this need, New York-Ohio Chemical Co., a subsidiary of Stauffer Chemical Co., turned to Pfaudler.

The answer: Hastelloy "C" for the tubes, and glassed steel for the bonnets, or headers. This combination cuts down on expense as well as corrosion. By using costly Hastelloy only where absolutely necessary, and taking advantage of the less expensive corrosion resistance of glass plus the working strength of steel, substantial savings were made.

Now you can greatly cut the cost of

heat exchangers, because corrosion-resistant glassed steel may be used readily in combination with any material of construction — often saving a wide margin on expensive alloys.

We recommend combination heat exchangers for the acid chlorides, sulfates, phosphates, wet and dry chlorine gas, and all concentrations of acetic, formic, hydrochloric, phosphoric and sulfuric acids to boiling temperatures.

Pfaudler

THE PFAUDLER CO., ROCHESTER 3, N.Y.